POPULAR SCIENCE

MONTHLY

MECHANICS AND HANDICRAFT

What COLOR Does to TV p. 100

25¢ September, 1951

Wilbur Shaw Reports on

NEW SPORTS CARS

PAGE 84

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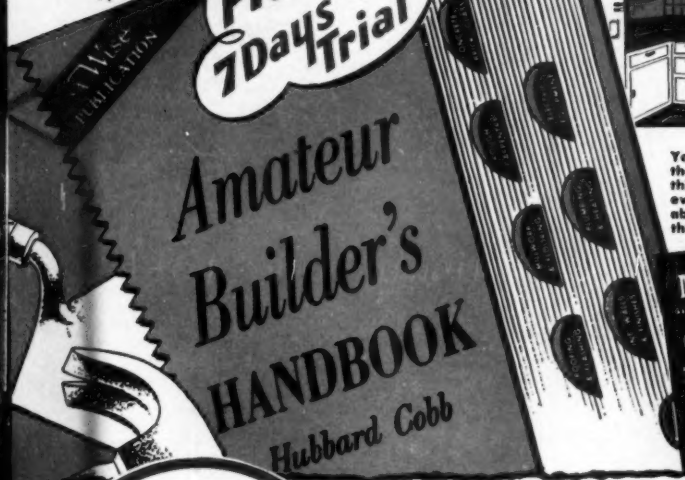

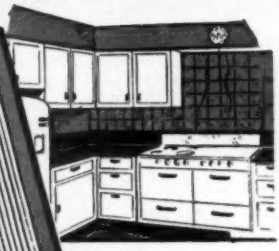

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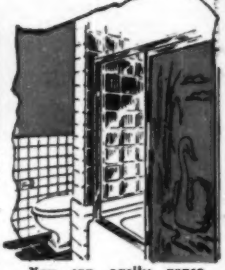

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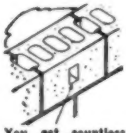

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Making Woods Fire-Resistant

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Cleaning Paint Spots
Floor Sealers
Decorating Old Floors
Color, Decorating Tips
Types of Finish—When, Where, How to Use
Whitewashing, Ingredients
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Paints for Brick, Concrete, Plaster

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Scaffolds
Ladders, Use and Precautions
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Kitchen Outlets
Bells, Chimes
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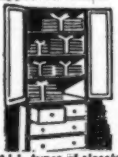

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Compare This Photo with the Cover Photo

It's color that makes the difference—PS' Bill Morris shot the cover picture of TV Star Ed Sullivan from a CBS color set, using Ektachrome Daylight film and 1/2-second exposure at f/2.8. For the inside story on what color is doing to TV, see page 100.

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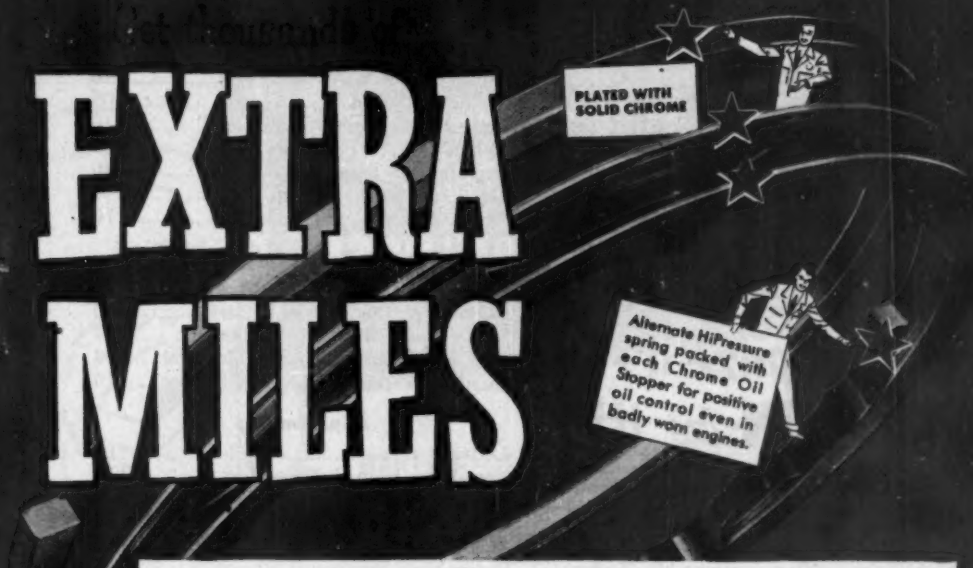

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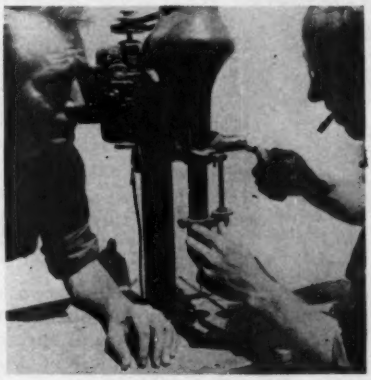
NEXT MONTH

Can You Spot a Power-Tool Bargain?



If you're dickering for a secondhand lathe, drill press or other power tool, you will want to save the series that begins in PS next month. It gives a lot of practical pointers on separating shopworthy tools from potential lemons.

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It is time you realized that the rites, rituals and practices of the ancients were not superstitions, but supterfuges to conceal the marvelous workings of natural law from those who would have misused them. Telepathy, projection of thought, the materializing of ideas into helpful realities, are no longer thought by intelligent persons to be impossible practices, but instead, *demonstrable sciences,* by which a greater life of happiness may be had.

One of America's foremost psychologists and university instructors, says of his experiments with thought transference and the powers of mind—"The successes were much too numerous to be merely lucky hits and one can see no way for guessing to have accounted for the results." *Have you* that open-minded attitude of today which warrants a clear, positive revelation of the facts of mind which intolerance and bigotry have suppressed for years? *Advance with the times;* learn the truth about your inherited powers.

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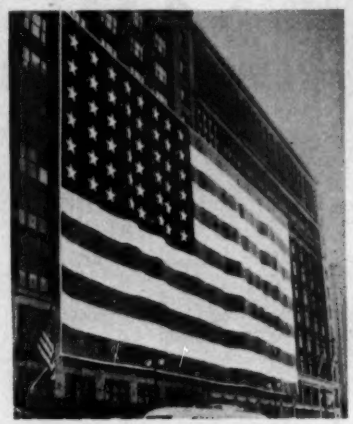
Letters

How Big Is a Flag?

The flag that you have pictured in the July issue [p. 56] flying on the George Washington Bridge in New York may be the second largest in the world, but not the largest. It is less than half as large as the one flown on occasions by the J. L. Hudson Co. in Detroit.



The Hudson's flag [shown above] is 235 feet by 104 feet and weighs 1,500 pounds. It takes 55 men to raise it and covers nine stories of the building.

BRUCE GRINAGER, Farmington, Mich.

Annin & Co., which made both flags, say the one on the George Washington Bridge—60 by 90 feet—is the world's largest free-flying flag they know of. The Hudson banner, though much larger, must be lashed down flat against the building and is therefore not considered a true flag.

How Do They Get It In?

If it's so dangerous to saw a sodium-filled valve [May, p. 16], then what I want to know is how do they manage to seal the sodium inside at the factory?

A. E. STONG, Wartrace, Tenn.

The sodium arrives at the plant in stick form and is handled by specially trained workers in a humidity-controlled room. It is melted in an enclosed furnace, piped to a tank over the production line, and fed into the valve beneath by remote controls. Then a plug is pressed into the end of the cavity and immediately welded in place.

Handy but Risky

I am very much surprised that Gus Wilson would suggest placing a pipe rack on a windshield [June '51, p. 161]. This is a perfect way to create a blind spot in a car that already has too many blind spots.

At least one state, Pennsylvania, makes it illegal to have anything on the windshield except the inspection sticker in the lower right-hand corner.

DAVID L. COWLES, Baltimore

Stingy Driving

In your article on the 1951 Mobilgas Economy Run [June, p. 168] you quote Les Viland, driver of the winning Lincoln, as saying that it pays to buy gasoline in the cool of the morning because the hot sun will have expanded it by late afternoon. But doesn't the BTU system go by weight?

PHIL JENSEN, Davenport, Fla.

A given weight of gasoline does have a given amount of BTUs. But you buy gasoline by volume, not weight. On a hot afternoon you pay the same price per gallon as in the morning, but expansion will have cut the weight of each gallon. Another way of looking at it: the gasoline has become inflated.

. . . Couldn't Viland have saved a few more drops of gas by completely closing the idling jet?

J. A. SMITH, Oklahoma City

Any gas saved in this way would have been offset by the inconvenience of keeping the engine running, especially during shifts.

. . . Viland says compression ratio changes with altitude. Isn't compression ratio a dimension just like the diameter of a crankshaft?

W. C. CONDIT, Newark, N. J.

It is, and compression ratio doesn't change. However, compression pressure *does*

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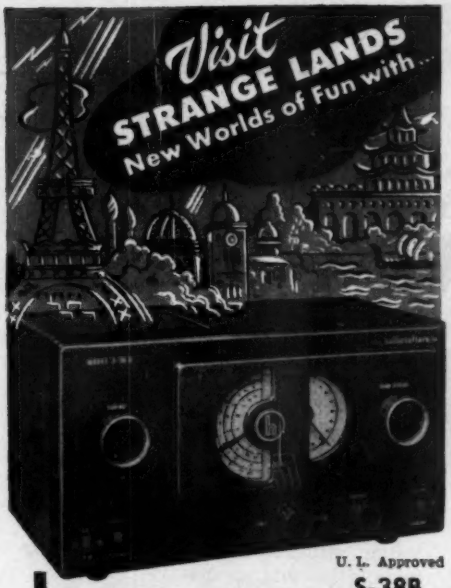

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drop when a rise in altitude decreases atmospheric pressure. Viland meant that an increase in altitude has the effect of lowering the ratio.

. . . I have heard that the Economy Run cars were equipped with a high-geared rear axle in conjunction with overdrive. Isn't this a violation of stock-car status?

R. P. SWEGER, Rockford, Ill.

Viland's Lincoln had a 3.31-to-1 rear axle, plus overdrive. A. C. Pillsbury, AAA contest board regional director, says his representative picked the car from factory assembly lines "on a day and hour unknown to anyone connected with the entrant or Lincoln factory."

Many days later the AAA representative found Lincolns still coming off the line with this same axle. Hence, hundreds of purchasers received Lincolns so equipped. However, if you bought a Lincoln with overdrive you might also get a 4.27-to-1 axle, what the Ford company calls a mountain gear. This might not give as good gas economy as the 3.31 axle, but all-around performance would undoubtedly be better in hilly country.

This Makes Scents

Hot-air furnaces are equipped with a water pan to humidify the air. By accident—using water that had been stored in a drum previously used for kerosene—I found that the furnace can be very well used to spread odors through the apartment.

Experiments with wintergreen oil and after-shave lotion were quite successful. I believe that the vapor from liquids with medical and insect-repellent qualities could likewise be spread just by adding the liquids in small quantities to the water in the pan.

HERBERT BAER, Hartford, Conn.

Quick & Easy Question Dept.

Which moving part of an automobile moves the least often?

HENRY HASELWITZ, Chicago

The wheel on the mileage indicator that moves only once every 10,000 miles.

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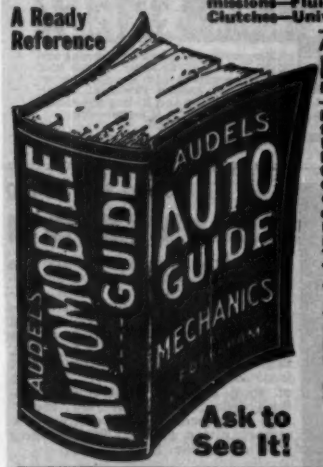

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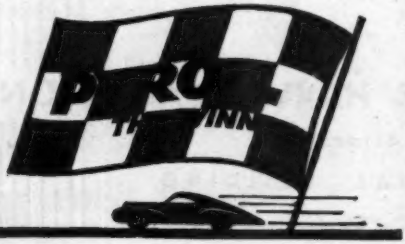

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750-16	7.94	710-15	6.34	32x6(8)	10.54	1000-22	17.54
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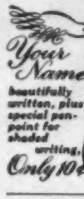

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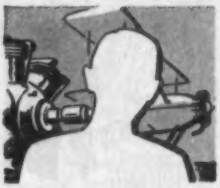

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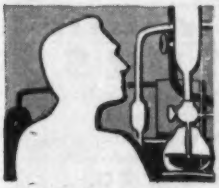

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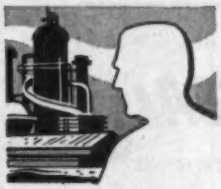

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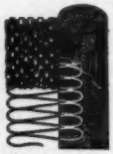

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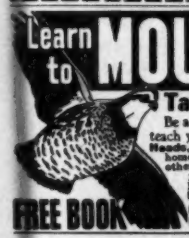

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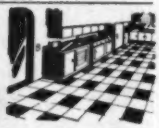

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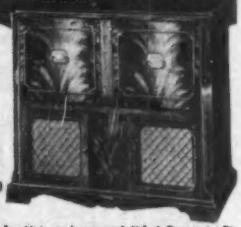

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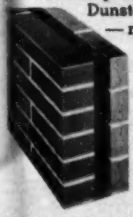

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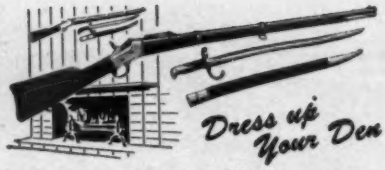

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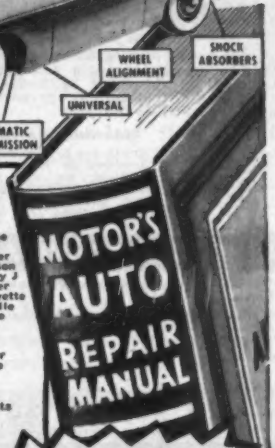

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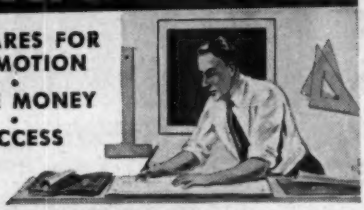

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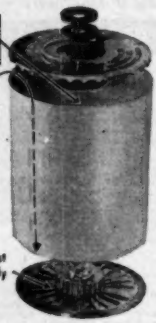

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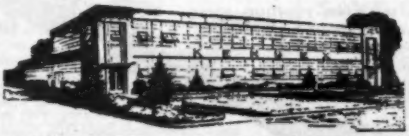

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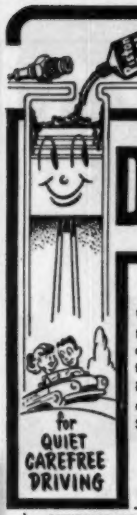

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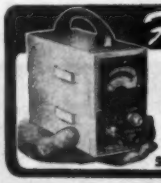

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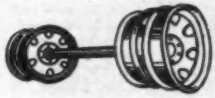

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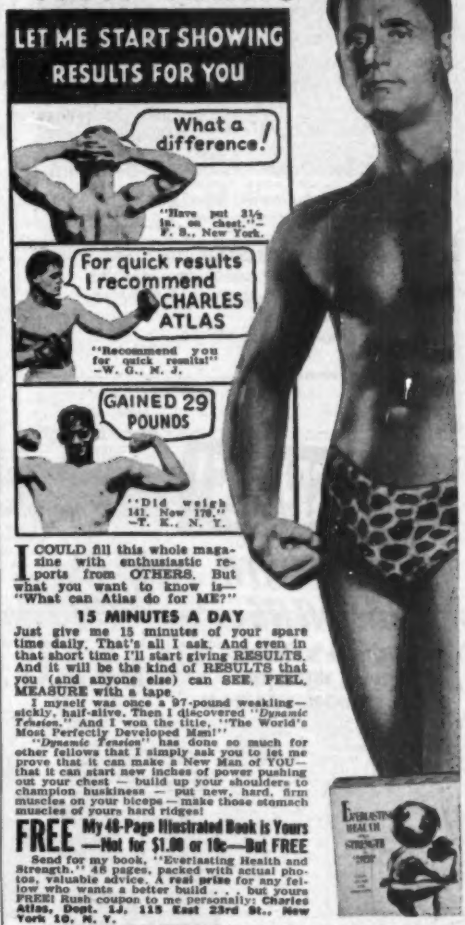

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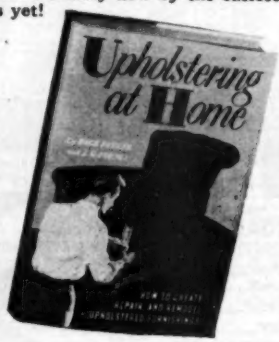

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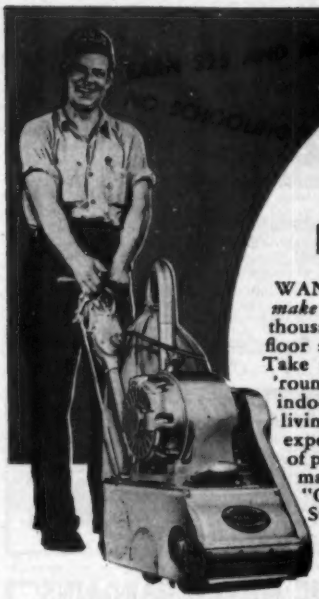

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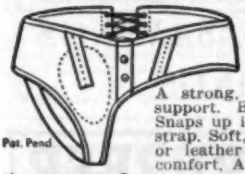

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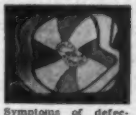

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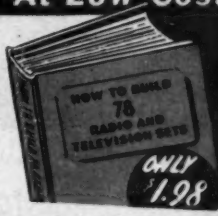

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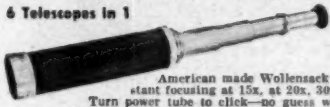

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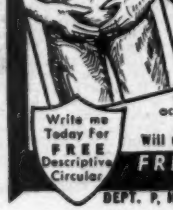

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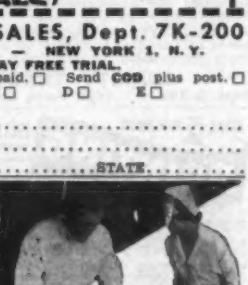

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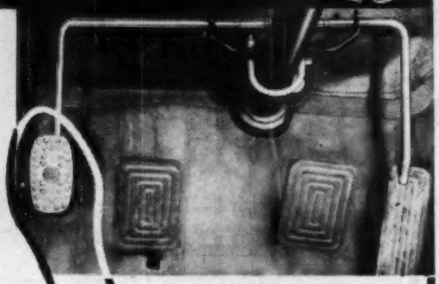

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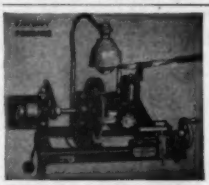

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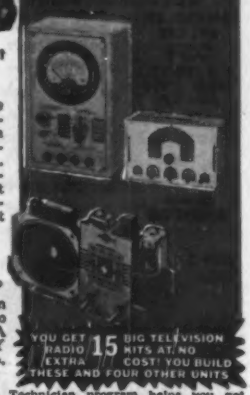

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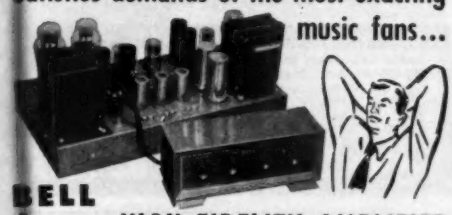

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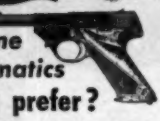

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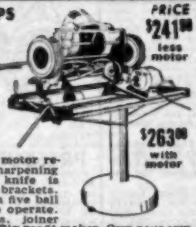

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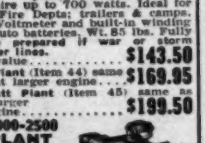

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(Item 35) Includes above illus. guar. drill, buffers, polishing bonnet, sanding discs, grinding discs, wood bits, steel bits, wire wheels, bench stand, paint mixer, burrs. Complete in metal case. Wt. 13 lbs. 38 pc's. all highest quality. Complete kit worth $38.50. Our spec. only.... **$19.85**

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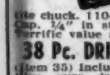

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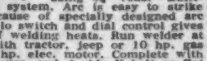

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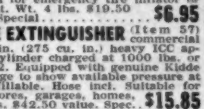
32 pc. SOCKET SET



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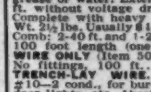

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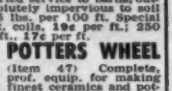

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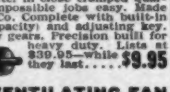

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WHIZZER, all attachments, $20; Cushman motorscooter $20; Indian motorcycle $30; engines $3 up; motorbike frame $3. Rush 25c (35c first class mail) for catalog #949 listing many other amazing bargains in motors, midget cars, motorscooters, motorbikes, etc. Associated, Box 1764-CB, Toledo, Ohio.

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AMERICAN, English Bicycles, Parts, Whizzers, Dynacycle, Bicycle Motors, Parts. Art's Cycle Hobby Shop, 816 E. 75th Street, Chicago 19, Ill.

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REBUILT Gasoline Engines. $17.00 to $37.00. Cauffiel Motor Industries, Temperance, Michigan.

HOTTEST surplus list in the country. Electronics, Hydraulics, Aircraft, Gadgets. Dick Rose, Everett, Washington.

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FREE—gift—women who sew. Hurry. Siegal, Box 183, New York 2.

$250 WEEK reported. Free book "505 Odd, Successful Businesses." Work home. Expect "Odd"!! Pacific-33A, Oceanside, Cal.

EXTRA Dollars. Spinning angora wool for us. Angora House, PSM, Springfield, Ill.

MAILING postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordon Publishers, Box 23, Pawtucket, R. I.

PROFIT!! Instructive Folios, revealing books; merchandise. Smith Associates, Paragould 4, Arkansas.

FREE Folio. 700 Money Making Deals, Plans, Formulas. Supply sources. Kolamite Company, Box 572, Dayton 1, Ohio.

RUBBER Molds! Professional molds for casting figurines, plaques, animals, religious, book ends, ash trays, banks, etc. Over 100 different! New illustrated catalog, 10c. Castcraft Studios, 508-PS Marion St., Brooklyn 33, N. Y.

DAYGLOW Business cards 1,000 $3.90. Samples free. Adena, 45 North First, San Jose, Calif.

BUY it wholesale. Manufacturers, Distributors. Over 850,000 items. Literature free. Olsen, 1231-B East Third St., Duluth 5, Minnesota.

EARN While You Sleep. Coin-radios. Johnny Kratz, Grantham 27, Penna.

38 MONEYMAKING OPPORTUNITIES

QUICK profits taking magazine subscriptions, handling greeting cards. Cassell Publishers Service, Westfield, N. J.

EARN Money Evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 2, Wisconsin.

DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner, P-125 West 86th, N. Y. 24.

WIN contest money. General Contest Bulletin gives hundreds of tips. List current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

CAN You Make $40.00 A Week, typing at home, in your spare time? Write Hood's, Karmapolis 11, North Carolina. (Enclose stamped, addressed envelope).

"EARN Money Addressing Envelopes!" Homework! Particulars, 25c! Hirsch, Spring Valley 3, New York.

SCHOOL Seniors—Earn sensational profits selling classmates America's Most Beautiful Graduation Name Cards. Largest selection. Outsells all others. Free sample kit. Printcraft, Dept. P, 1425 E. Elm Street, Scranton 5, Penna.

MANUFACTURE Rhinestone and Pearl Jewelry at home. Latest creations, tremendous profits, no skill needed. Postcard brings illustrated catalog of settings, stones, etc. A. V. Cutt Co. Inc., 210-H Fifth Ave., New York 10, New York.

$35 WEEKLY! Home! Two hours daily! 227 unusual money making projects. Walsh, 894 Main, Buffalo 2, New York.

MAKE and sell an inexpensive, proven item welcomed by smokers without machinery as I do. Details 25c. Thomas Sales, Box 301-PS, Camden 1, N. J.

PLATING formulas instruction 25 cents. Stratton, Plater, 432 Pearl St., Lancaster, Pa.

100,000 MONEY-making ideas. World's greatest collection. Start today. Catalog 35c. Cummings Co., 1321 Arch, Philadelphia 7G, Penna.

WHERE to swap-buy-sell anything! Free lists—information. Toole, 5 Bernardin Apt., Evansville, Indiana.

POPULAR SCIENCE OPPORTUNITIES

SEND 1 Dollar for product that should be in every home. Reassemble broken pearl necklace. Money back guaranteed if not satisfied. Hansman Product, 3017 42nd St., Long Island City 3, New York.

BE Appointed State Notary Public Now! Details; Stationers, Helotes, Texas.

WE pay you highest rates for hand-decorating greeting cards. Work at home. Experience unnecessary. Greetings, 120 Madison, Detroit 26.

$$$ IN Personalized Baby Record Books. Sell By Mail Use Same Literature We Do. No-Co-Ro, Oakland 6-P, Calif.

NEW Catalog and many Plans of money making ideas 25c. Swaty, Box 2775, Little Rock, Arkansas.

FREE Book "505 Odd, Successful Businesses." Work home. Expect "Odd"! Pacific-34A, Oceanside, Calif.

STUDENTS! Financial worries?—Unique solution, 50c—Meglu, 49 Hancock St., Chelsea, Mass.

MAKE money at home. Complete instructions furnished and sample of unusual product. Easy to make. Different from other items. Cost 20c, sells for $1.00. Postage prepaid. Send $1.00 to Robert Butler, 208 Troy St., Dayton 4, Ohio.

MAKE Real Money selling high class electrical fuses to factories your area. Good commission! Starco, 235 Canal St., New York City.

39 FORMULAS, PLANS, ETC.

FORMULAS, trade secrets, for nearly everything. Catalog free. Creative Publishers, Winnetka 7, Illinois.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 13, Ill.

LABORATORY tested formulas. Lists free. Pont, Box 635-PS, Terre Haute, Ind.

FIFTY years supplying the best in modern manufacturing formulas. Lists free. Miller, Chemist, Dept. 1517, Tampa, Fla.

ONE-Way mirrors, 25c. 3994 E. 33rd South, Salt Lake City, Utah.

SHEET metal bend allowance and setback tables. 10,000 answers eliminate flat pattern calculations. Metalsmiths, toolmakers, engineers, students, gadgeteers send $1.00 to Shipman, 9044 Ione, Affton 23, Missouri.

ANY Formula Furnished $10.00. Lan-ert, Box 327, Tucson, Arizona.

40 PLASTICS

NEW liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins. Saw, drill, carve. Free Folder. "Liquid Magic," shows fine things you can make and sell. Write today. Castolite, Dept. K-102, Woodstock, Illinois.

LUCITE, Plexiglas. Any size sheets masked Square foot (12 x 12) cost 1/16" $1.20; ¼" $1.40; 3/16" $1.75; ½" $2.00. Include 10% postage. Almac Plastics, 230 Fifth Avenue, New York 1, New York.

PLASTIC Sheets, Rods, Tubes, etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

HI-Profits—Gifts—Jewelry—Free catalogue, details. Pilot Plastics, 67-B Fulton St., New York City 38.

LUCITE, Plexiglas, acetate; casting, molding plastics, findings. Dye manufacturer. Quantity prices. Special bargain lots. Immediate shipment. Complete catalog 10c, 25c airmailed. Gem-O'-Lite, Box 6864, North Hollywood, Calif.

PLASTICRAFTERS supplies wholesale. Literature 20c. Cosmopolitan, Box 176-PS, New York 8, N. Y.

REPAIR False Teeth with Flint-lok! New sensational self hardening dental plastic. Generous supply handles twelve repairs. Outfit complete with instructions only $5.00. Grant Dental Laboratory, 219 W. 7th St., Los Angeles 14, California.

41 CHEMICALS & APPARATUS

NEW Idea Chemical and Apparatus Outfits for Home Experimenting. Photo-Scales, Microscopes, Chemicals, Biological and Laboratory Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York 11, N. Y.

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

LABORATORY Apparatus, Chemicals, Microscopes. Complete Chemistry Sets. Minerals, Uranium Ore. 10c brings catalog. Porter Chemical Company, Hagerstown 2, Maryland.

SPECTROSCOPE for quick chemical analysis $3.00. Cutting Sons, Los Altos, Cal.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

CATALOG of chemicals, apparatus, kits, minerals, Uranium ore, 10c. Rex Laboratories, 2849-B Birchwood, Chicago 45, Ill.

STUDENTS—Improve your marks. Check your Qualitative Analyses at home. Catalog 15c. B.&S. Amateur Chemist Supply, 191-49—115 Ave., St. Albans, N. Y.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N.Y.

OH Boy! New Book Of Science, Experiments, Formulas, Secret Processes, together with Catalogue of Laboratory Supplies, only 25c. National Scientific Company, Dept. 15, 2204 W. North Avenue, Chicago 47, Illinois.

42 HELP WANTED

FOREIGN & Latin American Employment, 1951 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms, Hot List Firms Hiring. $1.00 post-paid. Global Reports, P.O. Box 883-S, Hollywood 28, Calif.

$1,000,000 CONSTRUCTION Projects, "World Wide" printed Monthly Foreign & Domestic employment. Free application blanks tells How-When-Where to apply. $1.00 complete. Global Reports, P.O. Box 883-PX, Hollywood 28, California.

FOREIGN Employment Construction men, building trades, helpers, office men, others interested in Foreign Projects. High wages, quarters, trans. Listings of firms actively working on U. S., Foreign, Intercontinental Projects. Send $1 for Foreign Construction Compendium and Application Forms. Foreign Service Bureau, Dept. PS-9, Box 295, Metuchen, New Jersey. (Not an employment agency—no fees.)

THIS Is For You! Adventure, excitement, big pay. A job overseas! Send $1.00 for foreign job news, information, application forms, etc. DOS Foreign Job News, Dept. 268-GA, Bridgeport, Ill.

43 AGENTS WANTED

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 18, Chicago 4, Illinois.

DRESSES 18c; Coats $2.00; Blouses 35c; Free Catalogue; Crown, 164-PB, Monroe Street, New York 2.

COMMERCIAL Deep Frying Course. Mock Chicken Legs. Potatoes. New and proven methods. Learn about this money-making field. $2.50. PP. Concession, Toledo 13, Ohio.

AGENTS—300% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 437 N. Clark, Chicago.

PHOTO-Salesmen-Agents. Sell beautiful hand colored plastic enlargements and sensational new photo compacts, rings, bracelets, lockets, etc. Collect deposit, we deliver. Profitable sideline. Send card for Free sample kit. Novel Portrait Co., 3343-A North Ave., Chicago, Ill.

NEED Extra Cash? Take orders for personal initialed belts and buckles, cap badges, tie holders, etc. Choice of 3000 emblems. Free sales kit. Hook-Fast, Dept. 1425PS, Providence, R. I.

NYLON Uniforms. Immediate delivery, immediate profits. Free sales kit. Superior Fabrics, Dept. A-9, 3936 Market, Philadelphia 4, Pennsylvania.

CALL On Friends with sensational Christmas Cards in handy assortments. Exclusive designs. Sell for $1.00. Profit up to 50c. Also popular-priced Personal Christmas Cards. Everyday Assortments. Stationery. Gift Items. Samples on approval. Wallace Brown, Dept. C-4, N. Y. 10, N. Y.

JUST Out! New thrilling sensation in Christmas cards. Make big money! Show lustre foils, satins, brilliants. Amazing values bring easy orders! Christmas cards with name 50 for $1.25 up. Also imprinted book matches, stationery, many gifts. Get 30 Free Samples with name; several $1 boxes on approval. Joy Greetings, 507 N. Cardinal, Dept. L-61, St. Louis 3, Mo.

SALESMEN, Money-making sideline. Calendars and Advertising Specialties. Highest commissions advanced. Free New Cars. Rush name. Advertising Specialty Manufacturing Co., Brooklyn 36, N. Y.

START Your Own Business on credit. Always your own boss. 1 437 Dealers sold $5,000 to $28,500 in 1950; their average $6,704. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. I-U-PSC, Freeport, Ill.

ANYONE can sell Hoover DuPont Nylon Uniforms for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. R-101, New York 11, N. Y.

YOUR Personal Lingerie free as bonus—extra cash besides—introducing sensational Curve-Tailored idea to friends. Outfit Free. World's Star, Dept. E-43, Grand Rapids, Michigan.

$50.00 YOURS, sell only 100 boxes New Xmas Cards; other amazing offers. Free Samples imprinted cards. Feature box assortments on approval; over 100 profitable items. Work with a National Leader. Pen-'N-Brush, PS-9, 139 Duane St., N.Y.C. 13.

AT Last! Something new and sensational in Christmas cards. Make extra money fast! Show gorgeous satins, velours, metallics never before offered. Gets easy orders! Pays up to 100% cash profit. Free Samples 30 Christmas cards with name, 50 for $1.25 up, 80 assortments. Personalized book matches and stationery, gifts. Several $1.00 boxes on approval. Write Puro Co., 2801 Locust, Dept. 141-L, St. Louis, Mo.

EXTRA cash—quick, easy! Sell friends newest greeting cards. Profits to 50c per $1.00 box. 21-card $1.00. Comic Christmas. All-Occasion assortments. Gift Wrap Ensembles, exclusive items. Experience unnecessary. Special offers. Bonus. Prompt service. Write for free samples Name Imprinted Christmas Cards, Stationery, Napkins, Book Matches, Feature assortments on approval, free catalog. Elmira Greeting Card Co., C-2110, Elmira, New York.

IS $21.0 a week worth a penny postcard to you? Then rush card with name and address for special Free Trial Plan that sells amazing new Automatic Refrigerator Defroster "like hot cakes!" Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. PSC-9, 6 N. Michigan, Chicago 2, Ill.

DO you need money? $35.00 is yours for selling only 50 boxes of our 300 Christmas Card line. This can be done in a single day. Free samples. Other leading boxes on approval. Many surprise items. Experience unnecessary. Free samples Personalized Christmas Cards, Stationery, Napkins. Write today. It costs nothing to try. Cheerful Card Co., 324 White Plains, N. Y.

FREE Samples and amazing plan, giving you gorgeous Dress without penny cost. Rush name today, with dress size. Harford, Dept. E-335, Cincinnati 25, Ohio.

MAKE Wedding Profits. Sell invitations, napkins, matches. Samples free. Dunbar's, Middlebush 5, N. J.

CASH in on spare time. Sell wonderful Regal Christmas cards exclusive with us. 25 sell for $1.00. Also 50 for $1.25. Over 150 other boxes. Free samples. Kit on approval. Regal Greetings, Dept. 146, Ferndale, Michigan.

$80 WEEKLY making four sales daily! Sell cushioned, non-cushioned shoes. Work shoes guaranteed six months. Free outfit. Concordian Shoes, 16-C, West Concord, Mass.

POPULAR SCIENCE OPPORTUNITIES

FREE sample nylon stocking of world's only nationally advertised hosiery line actually guaranteed against runs and snags or replaced free within guarantee period to three months! Complete line from sheerest 15 denier to heavy 70 denier service weight. All gauges. Also complete line men's fine hosiery guaranteed for one full year! Not sold in stores. Good Housekeeping Guarantee Seal. No money or experience needed. Nothing to pay now or later. Easiest and quickest sales. Just show free outfits and write orders. We deliver and collect. Advance cash plus huge bonus to 40%. Big money spare or full time. Become manager—appoint others to sell for you. Man or woman, young or old, beginner or veteran, you can earn more money than you thought possible. Everything needed given free. Rush name and address to Kendex Corp., Babylon 94, New York.

CHRISTMAS Cards At Jobbers Prices! Large selection dollar assortments 35c each in hundred lots. Imprint Cards, Money Folders, Gift Cards, Pictures, etc. Make more profits selling our line! Catalog free! Three sample boxes $1.00. Elfco, 438 North Wells, Chicago 10.

FAST sellers. Big demand. Catalog. Parker Drug Co., Hoboken 6, New Jersey.

BRAND New! Amazingly different and smart Christmas cards bring you big money! Take easy orders fast. Pays up to 100% cash profit. Christmas cards with name 50 for $1.25, up. Big line. Personal stationery and book matches. Get sample assortments on approval, imprints Free. Write today. North Star, 31 Glenwood, Dept. X-19, Minneapolis, Minn.

FREE Merchandise to new customers ($1.50 retail value—your selection). Sensational "get acquainted" offer. Rush 25c for Illustrated Wholesale Bargain Catalog and Free Merchandise certificate. Save up to 50% on 2,000 everyday necessities and novelties. Reliable Jobbers, 311-J North Desplaines, Chicago 6.

MAKE money selling ties. Free catalog. Write to Philip's Neckwear, Dept. 812, 20 West 22 St., New York.

300% PROFIT—Postage stamp photos from negatives or prints, perforated sheet form, gummed backs. Free details, samples. National Photostamp Co., 1418-E Third Ave., New York 28.

EXTRA money reward! Free gift offers! Sell friends outstanding Christmas, All-Occasion greeting cards, Gift Wrappings, Novelties. Big profits. Bonus. Experience unnecessary. Request Feature assortments for free trial approval, free samples Name Imprinted Christmas Cards, Stationery, Napkins and free catalog. New England Art Publishers, North Abington 505-A, Mass.

BE A Money Maker . . . Represent magazines year around. Wonderful home work. Big Christmas profits now. Liberal commissions. Everything furnished. Write for Free catalog. McGregor Magazine Agency, Dept. 510A, Mount Morris, Ill.

SHINE Shoes Without "Polish." New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 133, Akron, Ohio.

EARN big money—Cash bonus—Popular sizes and styles—Free hosiery for your family. Duratest, Dept. P82, Warren, Pa.

SELL greeting cards—cleanup! Assortments, stationeries, wrappings at rock-bottom! Starting samples. Bluebird Studios 2, Redlands, Calif.

GOLD Lacquered and Silver Sign Letters. Windows, Doors, Trucks. Standard sizes. Penny each. Free samples. Atlas-G, 544 West 79th, Chicago 20.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 6255, Cincinnati 25, Ohio.

OWN A Big Moneymaking New and Used Clothing Business. Men's used suits $2.00, pants 35c, topcoats $1.25. Jackets 60c, shoes 20c. No experience necessary. Free wholesale catalog. Superior, 1250-B Jefferson, Chicago 7.

SALESMEN, Distributors, fast selling costume jewelry direct from factory. Big picture catalog free. Pickcraft, C-19 Bank, Attleboro, Massachusetts.

NEW Plastic Mending Tape. Just press on! Repairs clothing instantly. Lightning seller. Samples sent on trial. Kristee 132, Akron, Ohio.

SENSATIONAL money maker—washable woolen slacks, skirts, shirts—plaids and solid colors. Nationally advertised "Sanforian" label. Nylon reinforced, childrens, teen-age. Terrific repeat business. Bonus Plan. Start immediately. Free Sales Kit. Wash-Em, Westport 13, Conn.

$200.00 WEEKLY. Sell Silverplate. Colorful. Tablewear, Murphy's Yale, Meriden, Connecticut.

GREETING Card Salespeople—make $50 quick—or even more—selling America's leading 21 Card Christmas assortments. Samples on approval. Everyday assortments. Gifts. Free samples Personalized Christmas Cards. Write today. Lorain Art Studios, Dept. S-45, Vermilion, Ohio.

HI-Profits—Gifts—Jewelry—Free catalogue, details. Pilot Plastics, 67-B2 Fulton St., New York City 38.

A A A. Sensational Talking Christmas & Birthday Cards. Pull tape and card clearly says "Merry Christmas." 150% profit. Retails 25c. Sample 25c, five for $1.00 with wholesale prices. Minas, P. O. Box 18214-R, Los Angeles 33, Calif.

$3.00 AN hour selling cushioned shoes direct. Advance commissions. Bonus. No investment. Experience unnecessary. Free outfit. Samples. Paragon Shoes, 738 Columbus, Boston, Mass.

SLIP A Kalendile into your billfold. Show and sell. Everyone wants. Samples, terms, write. Dammon, Box 583, Tacoma, Washington.

BUZZ-Cut—for brush—weeds—grass—trees. Fall demand. Farm Products-PS, Excelsior Springs, Mo.

SELL Big Money-Maker to Men and Women. Easy handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Mass.

MEXICAN feather pictures. Sell on sight; 200% profit! Free details; sample 10c stamps. Sylvia-SP, Apartado 9036, Mexico City.

BUY Wholesale thousands nationally advertised products at big discount. Sent free "The Wholesale Plan." American Buyers' Service, 629-S Linden, Buffalo, N.Y.

WHERE to Buy 300,000 articles direct from Manufacturers. Save by buying direct. Sent Free. "Your Profits Under The Spotlight." Glass Pub. Co., Ellwood City 4, Pennsylvania.

EVEN beginners make many extra dollars! Sell big line Christmas, Everyday cards, gifts, 21 for $1.00 assortments, novelties, gift wraps, household items. Big profits. Free samples Name Imprinted Christmas Cards, Stationery, Napkins. Leader assortments on approval. Bonus. Special offers. Write. Pilgrim Greetings, 111 Summer, Dept. AO-7, Boston, Mass.

LADIES Garters, Hankies. Free samples. Holiday, 85-C6 96th St., Woodhaven, N.Y.

I'LL Put A "Shoe Store Business" In Your Pocket! Nation's Leader trains you to make Big Money! Fit men, women. Free Sample Outfit—Write Today! Consolidated Shoe System, Dept. 335-F19, Chippewa Falls, Wisconsin.

BARGAINS!! Save up to 50%. Balloons, combs, novelties, notions. Carleton House, (PSM), Texas City, Texas.

BE a Bob-Art Representative. Make $3.00 to $5.00 an hour in spare time between now and Christmas. Easy—show friend, neighbors. Bob-Art Special Christmas Card Bargains and other Appealing Specialties. Also get cash bonuses and valuable Merchandise Prizes. Send today for Sample Selling Kit with Free instructions. Bob-Art Greetings, Dept. 112, 278 Washington Ave., Chelsea 50, Mass.

FREE Book "505 Odd, Successful Businesses." Work home. Expect "Odd"! Pacific-32A, Oceanside, Calif.

44 HIGH-GRADE SALESMEN

MAKE Money with famous, easy-selling Bostonian shirts—spare time, full time, sideline. Fabrics, outfit Free. Bostonian, 89 Bickford, Dept. G-11, Boston 30, Mass.

EARN Big Money Fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. 549, Rochester, Indiana.

ADVERTISING book matches—Cash in on big demand—sell Union Label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash commissions. Superior Match Co., Dept. P-951, 7530 Greenwood, Chicago.

REPRESENT America's largest factory selling advertising pencils. High Commissions. Attractive line. Union Pencil Company, 385 Broadway, New York City.

WANT to make real money? You can positively make $50.00 a day and up selling a brand new item going to every type of food and beverage store, factories, Laboratories, Hospitals, etc. First time advertised. Write for Free Details today. Johnson-Hartman, 53 West Jackson Blvd., Dept. PS-9, Chicago 4, Illinois.

BIG Money Taking Orders: Shirts, ties, sox, pants, jackets, sweaters, shoes, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-AV Lincoln, Chicago.

AD Matches! Sell Amazing Designs—20, 30, 40 and 240-light book matches. Biggest spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy Nothing! Sales kit furnished. Match Corp., Dept. PS-21, Chicago 32, Illinois.

MAKE money showing neighbors how to beautify yards with glorious flowering shrubs and trees. Quick-bearing Dwarf fruit trees: World-Famous Stark Patented Varieties produce abundant harvests champion-quality apples, pears, peaches, other fruits. Even small plots produce fruit for family-use and to sell. Beautiful Sales Kit Free. Stark Bro's., Dept. 30192, Louisiana, Missouri.

UP to $50.00 in a week spare time and tailored suit for yourself without paying one cent. Write for plan and Free Sample Case. Pioneer Tailoring Co., Dept. X-1121, Congress & Throop St., Chicago 7, Ill.

45 EDUCATIONAL & INSTRUCTION

USED Correspondence Courses and Books sold and rented. Money back guarantee. Catalog free. (Courses Bought). Lee Mountain Pisgah, Alabama.

BOOKKEEPERS! Increase your earnings! Operate your own simplified "Dollar-A-Week" Bookkeeping and Tax Service. Full or spare time. Details Free. No obligation. Ellis, Box 203, Cedar Grove, N. C.

START a Collection Agency business. Very profitable. Quickly learned. Write Cole & Associates, Syracuse 2, N. Y.

HIGH School—No Classes. Study at home. Spare time. Diploma awarded. Write for Free catalog HBA-5. Wayne School, 2527 N. Sheffield, Chicago 14, Ill.

REAL Estate. Complete home-study course. Successful students throughout America. Free information. Write School of Real Estate Training, Dept. PM, 128 Broad, Stamford, Conn.

ALGEBRA, Trigonometry, Calculus. Individualized instruction. Free details. New Correspondence School, Box 27, St. Johns, Brooklyn 13, New York.

BECOME a Doctor of Psychology or Metaphysics. Teach secret of contentment, happiness. Win degree of PsD. or MsD. Solve mental worries. Free book. College of Universal Truth, 5153-K N. Clark, Chicago.

$200 WEEKLY Reported! No selling. Free booklet. T. J. Surface, Roanoke 4, Va.

U. S. Gov't Jobs! Men—Women. 50,000 jobs open now! Start high as $66.34 week. Experience usually unnecessary. Can you qualify? Get Free 32-page book—showing jobs, salaries, requirements, sample tests. Write: Franklin Institute, Dept. A-22, Rochester, New York.

MEDICAL Laboratory Technicians in great demand. We train you in your own home. Catalogue free. Imperial Technical Institute, Box 973-B, Austin, Texas.

INCREDIBLE! Unprecedented! Look under "Personal!" Bijou, Box 1727-VF, Hollywood 28, Calif.

POPULAR SCIENCE OPPORTUNITIES

LEARN Tailoring in one of America's finest tailoring schools. Write book 10. Empire Institute of Tailoring. 422 East 5th, Hazleton, Pa.

SUCCESS in business and social life—strengthen your voice! Free booklet. Prefect Voice, Studio 2J-1, 210 South Clinton, Chicago 6.

USED Correspondence Courses and Educational Books Bought, Sold, Rented. Catalog Free. Educational Exchange, Summerville, Georgia.

BARTENDING — Management—Home study or Resident Training. American Bartending School, 334 S. Wabash Ave., Chicago 4, Ill.

WAKE Up your success powers and winning ability. End money worries. Overcome handicaps. Get ahead. Our new method of thought-control and behavior mastery gets results in every case or no cost. Send for free booklet and details. School of Personal Psychology, 10th Floor, Washington Bldg., Louisville 2, Kentucky.

HAIRCUT as you like it. Booklet tells how 25c. Mastrolia, 5½-AZ, Jane, New York City 14.

WELDING training pays at Hobart Welding School. Box P-912 Troy, Ohio. VA Contract. Best equipment. Catalog Free.

$5,000 YEARLY Interest You? Learn Lumber inspection. W. Tidaback, 506 Buchanan St., Hillside 5, New Jersey.

DRAFTING—Learn at home. Booklet free. Monroe Institute, PS-9, Alton, Ill.

BOOKKEEPERS! Read, "What you should know about a bookkeeping service", 25c. James, Box 1281, Lubbock, Texas.

HOME Study. Drugless Therapy. Psychology. Philosophy Deg. Western University, 3693 5th Avenue, San Diego, Calif.

SCIENCE of memory amazingly simplified. New book. Information free. Memorology Studio, 2016-S Sunnyside, Chicago 25, Illinois.

46 CONTESTS

TIE-Breakers exposed. Picture Puzzle contestants, now you can win big cash prizes. Your key to fortune. $1.00. Wenograd, Box 1495, Philadelphia, Penna.

47 DETECTIVES

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write, Wagoner, P-135 West 86th, New York 24.

SECRET Service, fingerprint training at home, in spare time. Write, Associated Special Investigators, Box 474, Saint John, N.B., Canada.

48 LANGUAGE OUTFITS

IT'S Fun Learning A Language by Linguaphone. At home, quickly, easily, correctly master Spanish, French, German, Russian, Asiatic—any of 29 languages through Linguaphone Conversational Method. Add to service, job, travel opportunities. Approved for Veterans' Training. Send for free book. Linguaphone Institute, 5409 Rockefeller Plaza, New York City.

50 BUSINESS SERVICE, INFORMATION, NAME LISTS

MAILING Lists. All kinds 1000 $5.00. Dixie Service, King, N. Carolina.

MILLION names state your needs. Q Service, 465 Chestnut, Burlington, Wisc.

51 SPECIAL SERVICES

LETTERS remailed New York, Montreal, London. Interesting folder free. Box 48, Brooklyn 25, New York.

LETTERS Remailed 25c each. 8 Scenic postcards $1.00. Stadler, 3335-S Hollywood 28, Calif.

52 AUTHORS SERVICE

I WANT New Writers. Earn at home, spare time. Details Free. Saunders M. Cummings, 468-15 Independence Bldg., Colorado Springs, Colo.

"TEN Steps To Writing Success" reveals How you can write stories, poems, articles for publication. Details Free. Will Herwell, 7016 Euclid, Cleveland 3, Ohio.

53 ADVERTISING

ADVERTISE: 24 words, 40 Newspapers, $3.50. Lists Free. Advertising Bureau, 10511-P Springfield, Chicago 43.

24 WORDS in 50 Weeklies, $4.96. H. J. Darnell, 730 Hays, Jackson, Tennessee.

ADVERTISE: 40 Texas Weeklies, $3.50 (24 Words). M. Pennebaker, Kerrville, Tex.

54 CARTOONING, SIGN PAINTING, CHALK TALKS

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 199-C, Pleasant Hill, Ohio.

BE smart. Get in Art. Let me start you Free. Nick Nichols Arts, PS, 39 West Adams, Chicago, Illinois.

CHALK Talks, Laugh Producing Program. $1.00. Illustrated Catalog 10c. Cartoonist Balda, Oshkosh, Wisconsin.

55 TYPEWRITERS & OFFICE MACHINES

PRINTOMATIC selffeeding Post Card printing Duplicator $15.75. Envelope Addressing Machines $24.50. Pittsburgh Typewriter Company, 336-O Fourth Avenue, Pittsburgh 22, Pa.

TYPEWRITERS, Printing Devices, Office Machines supplies appliances. Dixie Graph, King, N. Carolina.

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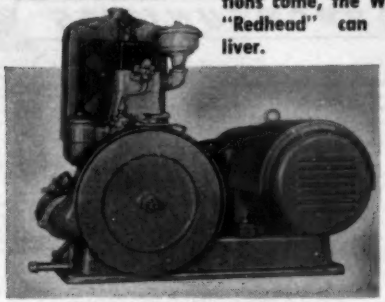

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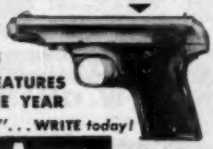

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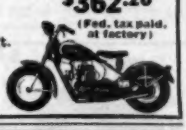

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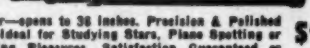

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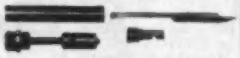

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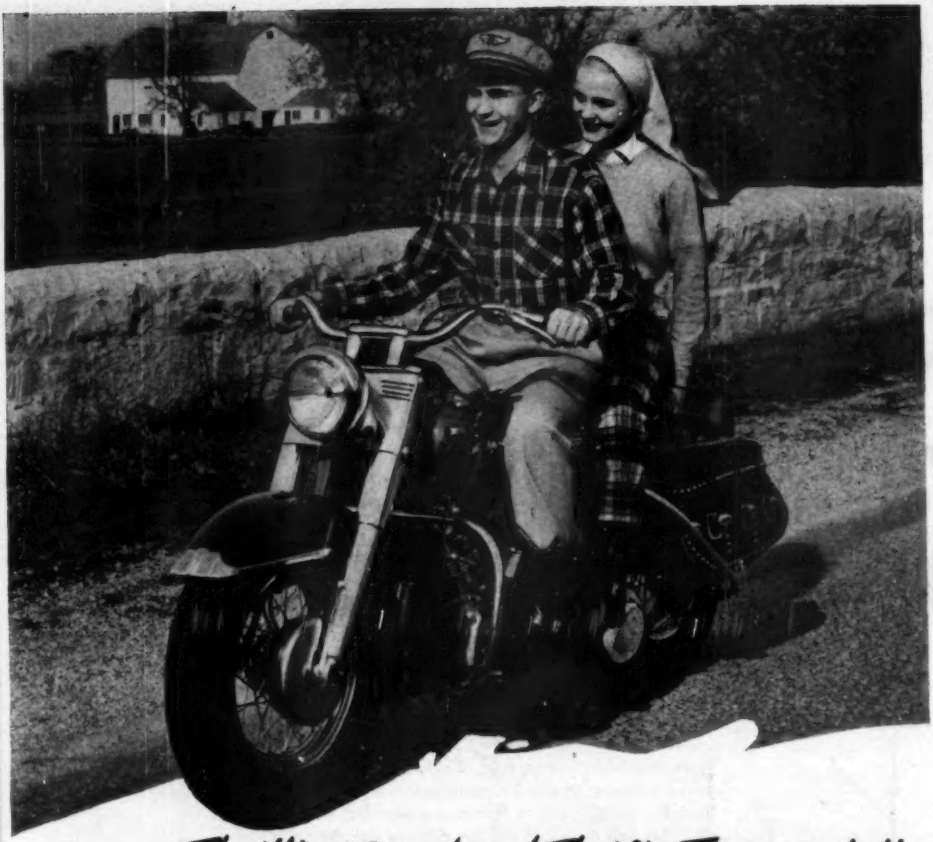

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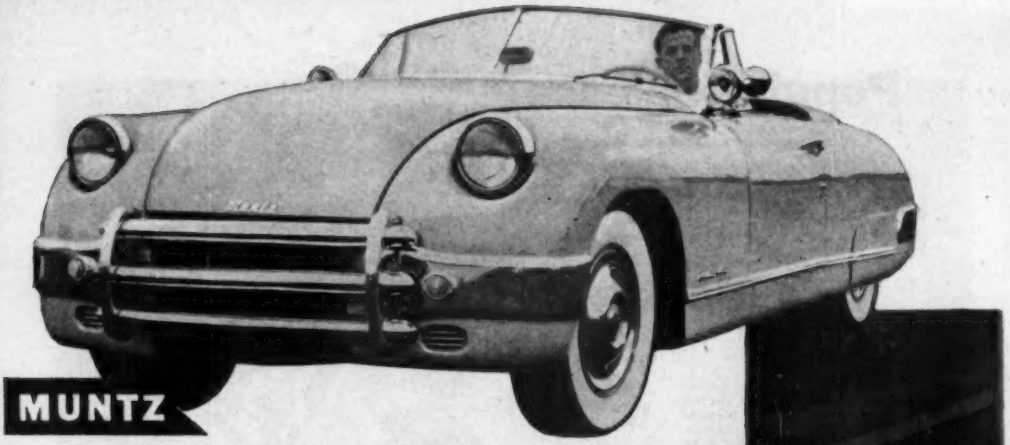
Popular Science *Highlights* This Month

Sunday driving was never like this . . . stock-car racing gives fans a thrill a minute as cars pile up in a 70-m.p.h. traffic jam. Page 153

This 1879 wood burner is part of a miniature wonderland for model railroaders—the 4,500-foot right of way of the UCON RR. Page 130

No use talking—alibis won't beat the rap for this tipsy motorist. The cops are taking him down to the station house for a test on the Alcometer. Page 124

You can't afford to gamble on the biggest investment of a lifetime. If you're planning to buy a house, here's what to look for before you sign. Page 166



When Sam Hanks of Muntz began telling me about the performance of his Jet, I put my tongue in my cheek—but not for long. The car sells for $5,210 at the factory, including the federal tax. That's Sam at the wheel.

Here's the Jag, with Shaw up, as they say. The best known of British sports cars sold in this country, it's one of the world's fastest stock jobs. It costs $3,945 in New York. All three cars will average better gas economy at highway speeds than your own family sedan.

By Wilbur Shaw

IF YOU don't like sports cars, you're normal. They ride hard. Top down, they're hot in summer. Top up, they're cold in winter. They rattle. Their first cost is high and the resale value low. But the real cost lies in their limited utility—sports cars are strictly for fun.

Anyone who likes sports cars has to be a little addlepated. I love 'em.

This month, let's go out to the Indianapolis Speedway and drive the Nash-Healey and the Muntz Jet—the first sports cars bearing American names in a quarter of a century. And for comparison, we'll take along a British Jaguar.

Open that right-hand door in the Nash-Healey and settle yourself in the seat. This car is made in England with a Nash Ambassador engine and driving components. Here's the way I talked into my automatic recording set as I felt out this flashy job:

The Nash has room . . . you can put three people in this seat . . . it would be a tight fit, but you could do it . . . the car's low-hung, in the best sports-car tradition . . . and your legs stick out in front on this low cushion . . . uncomfortably, and that's the tradition too . . .

REPORT FROM THE DRIVER'S SEAT...

Shaw Compares 3 Sports Cars

Most cars are made for comfort, miles per dollar or all-around utility—these dreamboats are strictly *pour le sport*.

Bob Sanford of Nash Motors makes with the smile at the wheel of the Nash-Healey. Donald Healey, the designer, reports remarkable road-holding qualities for the car in European races. The price: $3,982 in New York.

I knew this car had what it took. A Nash-Healey averaged 89.2 miles an hour for 2,143 miles in the 24-hour race at Le Mans, France, last June.

The starter yammers, as it should . . . and there's that wonderful mutter from the exhaust . . . no orchestra ever played sweeter music than that.

As I started rolling, I "mashed" it—I put the accelerator on the floorboard.

This car's got sass . . . I catch myself easing off . . . I'm not taking the turns at full-throttle . . . sports cars like these are often used for road racing, never for closed-track racing . . . let's emphasize that point . . . there's something annoying about the control arrangements on this car . . .

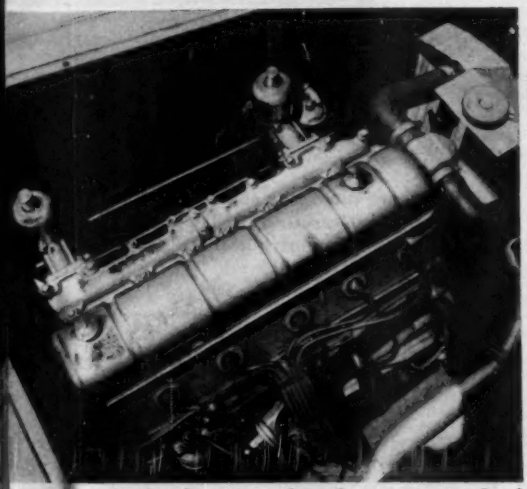
Now, the southeast turn . . . the Nash corners well—there's little sway despite all-around coil springs . . . let's stop at the straightaway on the backstretch and see what she'll do from a standing start.

Now I stop-watched its pickup on the broad, smooth track.

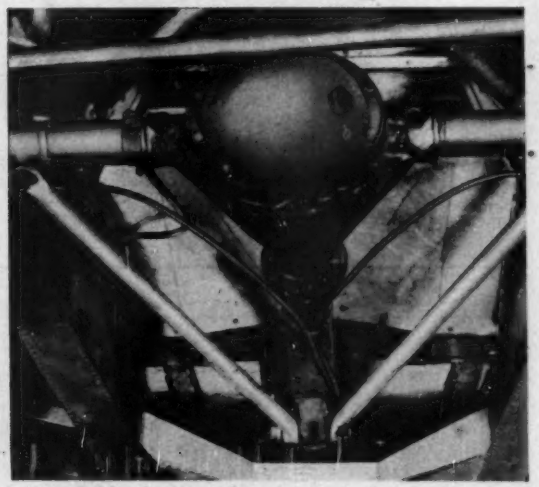
Three seconds . . . four . . . five . . . six . . . seven . . . eight . . . nine . . . there's an indicated 60 miles an hour at 9.1 seconds. That's fast, but she'll do better.

There was plenty of power there. I knew I hadn't taken full advantage of the torque

Nash-Healey: a special head and a body shell in the finest sports-car tradition.

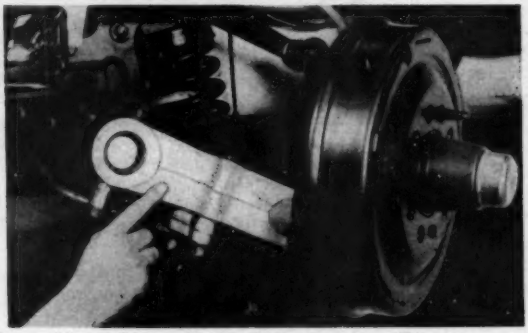


Dual carburetion and an aluminum racing head give the modified Nash Ambassador engine 10 more horsepower and a compression ratio of 8.1:1. Nash claims a top speed of 125 m.p.h.



This car, like the two others, has a sturdy box-section frame. There are five cross-members for rigidity. The ground clearance at the Pitman arm is pretty slim—only 4½ inches.

I'll bet Nash changes the location of the accelerator pedal. You have to be a contortionist to reach it between the clutch and brake. The steering wheel is adjustable fore and aft.



Donald Healey and I part company on this trailing-link design to the spindles. It gives the wheels a tendency to lay over in a high-speed turn. Alfa-Romeo junked it 15 years ago.

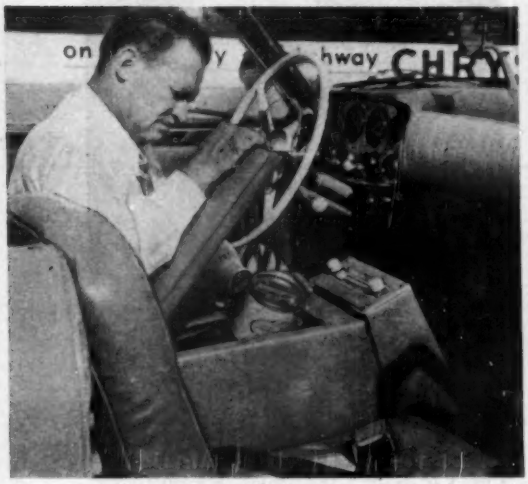
buildup. I'd shifted gears at the wrong intervals. I tried again.

. . . six . . . seven . . . eight . . . there's 60 at 8.6 seconds . . . five seconds better than the fastest stock car I've ever driven.

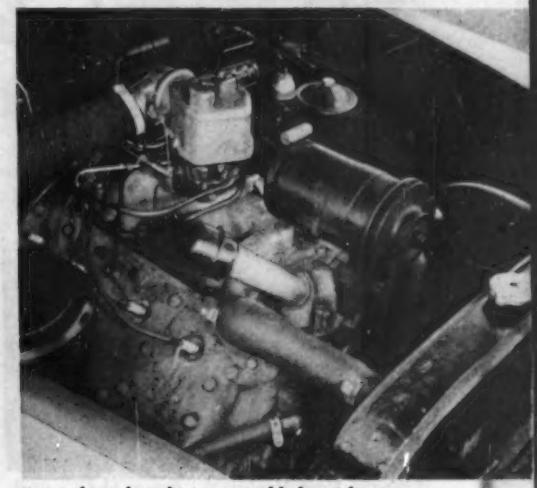
The Muntz and the Jag would have to go some to beat that. On the way back to the Speedway pits, where the other cars were parked, I discovered what had been annoying me about the Nash. It was the position of the accelerator pedal.

Now, let's climb into the Muntz. This car is a cross between a sports car and a fine sedan. It has a hard top, which is removable, and an automatic transmission. With that transmission, it's a tight squeeze to get

Muntz: as gimmicky as the most passionate automobile fan could wish for.

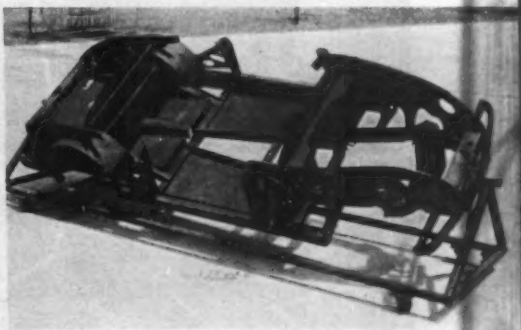


The Muntz is full of compartments. This one's between the two front seats. Ahead of it is an airplane-type radio pedestal. Give Muntz credit for seat belts and a real crash pad.



I wonder what this car would do with an overhead valve engine. This is the unmodified Lincoln L-head. At the Evanston factory they make the frame, superstructure and body skinning.

Two bolts and three thumbscrews fasten the 65-lb. steel-frame top to the body. The Muntz will get up to about 110 m.p.h. indicated. The car used to be known as the Kurtis-Kraft.



The frame has sustained a 100-m.p.h. collision without buckling. The Muntz has a Ford rear end, front end, brakes and wheels, and a Lincoln steering gear. Ground clearance is 6½ inches.

the Muntz into the sports-car class. A man who drives a sports car *likes* to shift gears.

The Muntz also has an insulated ice box. I shudder to think what a sports-car purist would say. But it could be handy.

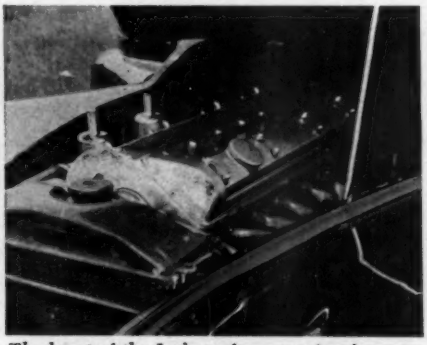
This car rides a lot better than a regular sports car . . . it's sprung and shocked better . . . it corners beautifully . . . there's no sway on a hard, flat turn . . . that must be due to the stiff semi-elliptic rear springs . . . your leg position and leg room are far more agreeable than in a conventional sports car . . . but there's no satisfying snort from the exhaust when you open her up . . . the sports car fans won't like that . . .

I didn't expect too much from the Muntz

Jaguar: a racing-type engine, overhead cams and a suspension for high-speed turns.

Like the Nash-Healey, the Jaguar has a pencil-length gearshift lever, an adjustable steering wheel and a floor tunnel of acceptable height. The car has four forward speeds.

I liked the Jag's underpinnings best. Its stabilizing transfer torsion bar between the front wheels is just now being adopted for racing cars. The ground clearance is 7¼ inches.



The heart of the Jag's performance is, of course, the engine with its two overhead cams. This type of valve-actuation is generally accepted in today's racing-car designs.

Like all sports cars, the Jag is full of items like this integral gas-tank lock cap. But the car badly needs a couple of air vents to cool the feet. It will do an honest 125 m.p.h.

as it was a heavy automobile compared with the Nash-Healey and the Jaguar. The Nash, with 125 horsepower, toted only 20.8 pounds per horsepower, the Jag, with 160, even less—17.8 pounds—and the Muntz, with 154, almost 23 pounds.

Moreover, both the Nash and the Jaguar had overhead-valve engines—the latter with twin overhead camshafts—while the Muntz engine was an L-head, almost obsolescent in today's high-compression market.

But I was due for a surprise. I stopped dead on the backstretch and then let her have it.

. . . *five* . . . *six* . . . *seven* . . . *eight* . . . *nine* . . .

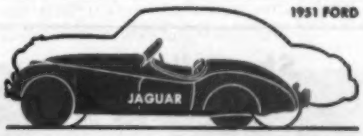
Facts on the NASH-HEALEY

Make and model: Nash-Healey sports car.
Engine: Nash Ambassador 6-cyl. valve-in-head; 125 hp. at 4,000 r.p.m.; car weight per hp., 20.8 lb. (dry); bore and stroke, 3⅜" by 4⅜"; compression ratio, 8.1:1; piston displacement, 234.8 cu. in.
Engine piston travel: (in feet per car mile at 20 m.p.h.)—2,302; in overdrive, 1,611.
Crankshaft bearing surface: 59.08 sq. in.
Torque: 210 lb.-ft. maximum.
Transmission: 3-speed manual, overdrive.
Rear-axle ratio: 4.1:1.
Steering: 3 turns lock to lock.
Radius of turning circle: 17′ 6″.
Springs: coil, front and rear.
Effective brake-lining area: 176 sq. in.
Weight and outside dimensions: 2,600 lb. (dry); height to top of windshield, 52⅜"; over-all length with bumpers and guards, 172"; width, 66"; wheelbase, 102"; front overhang, 30"; rear, 43½"; tread, front, 53"; rear, 54⅜".
Inside dimensions: seat-cushion width, 53"; leg room, 41⅛"; seat height, 9"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 5½"; seat adjustment, horizontal, 5"; vertical, zero.
Tire size: 6.40 by 15.

Facts on the MUNTZ JET

Make and model: Muntz two-door Convert-a-Coupe.
Engine: Lincoln V-8 L-head; 154 hp. at 3,600 r.p.m.; car weight per hp., 22.7 lb. (wet); bore and stroke, 3⅜" by 4⅜"; compression ratio, 7:1; piston displacement, 336.7 cu. in.
Engine piston travel: (in feet per car mile at 20 m.p.h.)—1,690.
Crankshaft bearing surface: 46.5 sq. in.
Torque: 175 lb.-ft. at 1,200 r.p.m.
Transmission: Hydra-Matic.
Rear-axle ratio: 3.31:1.
Steering ratio: 21:1.
Radius of turning circle: 24′ 7″.
Springs: front, coil; rear, semi-elliptic.
Effective brake-lining area: 176 sq. in.
Weight and outside dimensions: 3,500 lb.; height, 56½"; over-all length with bumpers and guards, 188"; width, 68"; wheelbase, 116"; front overhang, 29"; rear, 43"; tread, front and rear, 56".
Inside dimensions: seat-cushion width (two seats), front, 23" each; rear, 42"; leg room, front, 42"; rear, 29"; headroom, front, 38"; rear, 37"; seat height, front, 12½"; rear, 11½"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 7⅜"; front-seat adjustment, horizontal, 2½"; vertical, zero. (Seat height fixed at factory to specification of purchaser.)
Tire size: 6.70 by 15.

Facts on the JAGUAR



Make and model: Jaguar XK 120 sports car.
Engine: 6 cyl. valve-in-head with twin overhead cams; 160 hp. at 5,400 r.p.m.; car weight per hp., 17.8 lb. (wet); bore and stroke, 3 17/64" by 4 11/64"; compression ratio, 8:1; piston displacement, 209.8 cu. in.
Engine piston travel: (in feet per car mile at 20 m.p.h.)—1,890.
Crankshaft bearing surface: 63.43 sq. in.
Torque: 195 lb.-ft. at 2,500 r.p.m.
Transmission: 4-speed manual shift.
Rear-axle ratio: 3.64:1.
Steering: 3.5 turns lock to lock.
Radius of turning circle: 15′ 6″.
Springs: front, torsion bar; rear, semi-elliptic.
Effective brake-lining area: 208 sq. in.
Weight and outside dimensions: 2,856 lb.; height to top of windshield, 48½"; over-all length with bumpers and guards, 173"; width, 61½"; wheelbase, 102"; front overhang, 25"; rear, 46½"; tread, front, 51"; rear, 50".
Inside dimensions: seat-cushion width, 43"; leg room, 45½"; seat height, 7"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 7¼"; seat adjustment, horizontal, 4"; vertical, zero.
Tire size: 6.00 by 16.

Sam Hanks of the Muntz Company had come over to the backstretch to watch his car perform. I drove past him slowly as I came back from the north end of the straightaway.

"Nine and four-tenths to 60," I called.

"You're nursing it!" he complained.

I tried again.

. . . six . . . seven . . . eight . . . there's 60 at 8.9 seconds . . . and that's astonishing.

I switched cars again to see what the Nash would do in the higher speed registers. Having a highly developed sense of self-preservation, I didn't try to hold any of the

cars open all the way around the track. But I could get an idea of their capabilities.

The Nash had plenty of scat up to 85 miles an hour. Then it began tapering off. The Muntz had a bit less oomph up to 85, but went on strongly past 90.

Shifting Is Part of the Fun

Finally I was ready for the Jaguar. I've driven a Jag often in the last 15 months because Tony Hulman, chairman of the board of the Indianapolis Speedway, owns one. Any man who enjoys looking at a pretty woman likes the Jaguar. Its lines were stolen strictly from nature.

Let's roll the Jag on the backstretch.

This rattles, like the Nash-Healey . . . that makes it a sports car . . . but that noise from the exhaust is pure Bach . . . the man who doesn't like to go through all four gears of this thing in accelerating doesn't belong in the driver's seat of a sports car . . .

The suspension on this car probably is the best of the lot . . . torsion bars for the front and semi-elliptics in the rear . . .

I braked to a stop on the lip of the backstretch straightaway.

. . . seven . . . eight . . . nine . . . come on, baby, you can do better than that.

I tried again.

. . . six . . . seven . . . eight . . . that's better—8.9 seconds to 60.

They work in a high-level radiation laboratory. The speaker has been cleaning out cells or vaults hot with radioactivity. Such rooms frequently are painted with a strippable paint. After an experiment is performed, the cell is painted again. The two coats are then stripped off with the radioactivity imprisoned. This is known as a hot sandwich. A cutie pie is a pistol-grip meter that measures radiation.

A later speedometer calibration showed that the Jag was perhaps a trifle better on acceleration than the Nash-Healey. It should have been, with its horsepower-weight ratio. Where the Jag had it on both the Nash and the Muntz was in the high-speed department.

A specially built Jaguar, prototype of a model to go into production later, set a new course record at Le Mans this year with an average speed of 93.76 miles an hour for the 24 hours. For a road race, brother, that's traveling!

Standard Car Is Better Engineered

Sports cars do have acceleration and speed, but in design and manufacture they don't compare with a standard passenger car. As much as 500 times the engineering talent goes into a Ford, Hudson, Studebaker or Chrysler as goes into a sports car. That's where you get all the reliability and convenience that make everyday driving so simple and pleasant. The buyer of a true sports car gets performance, but he doesn't get as much automobile.

And I'm not talking about hot rods. The hot rod is a high-performance mongrel. The sports car is a true breed, a production blueblood.

Cruising Along at 90

As the Jag hit 60 and the speedometer wound up, I let her touch 90 at part throttle and cling there. The wind tore at my shirt, and from under the hood came that king-size hum of power. The curves came up on me at right angles, as they always do in high speed on the track, and then they smoothed away, and ahead of me was the long, inviting vista of the straightaway.

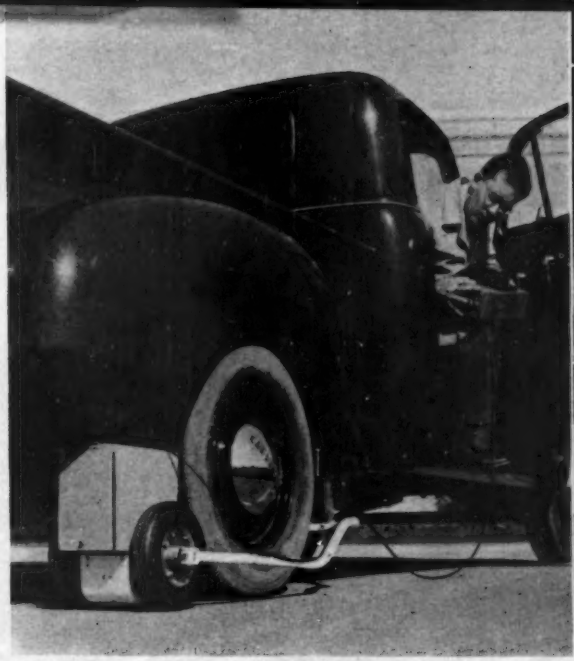
As the Jag flashed on to the bricks in front of the grandstands, I seem to have made the following entry on my recording machine:

"You don't have to be crazy to like sports cars, but it helps." END

This Month's Shaw-ism

I'll bet that the oldest driver in the world was never the fastest.

Kilton Shaw



Rolling behind test car's radioactive tire, Geiger counter checks "hot" particles left on road, while air scoop sucks in airborne ones.

Film is laid on track of "hot" tire. When developed (inset), it accurately shows sizes and numbers of worn-off tread particles.

Radioactive Tires Test Wear

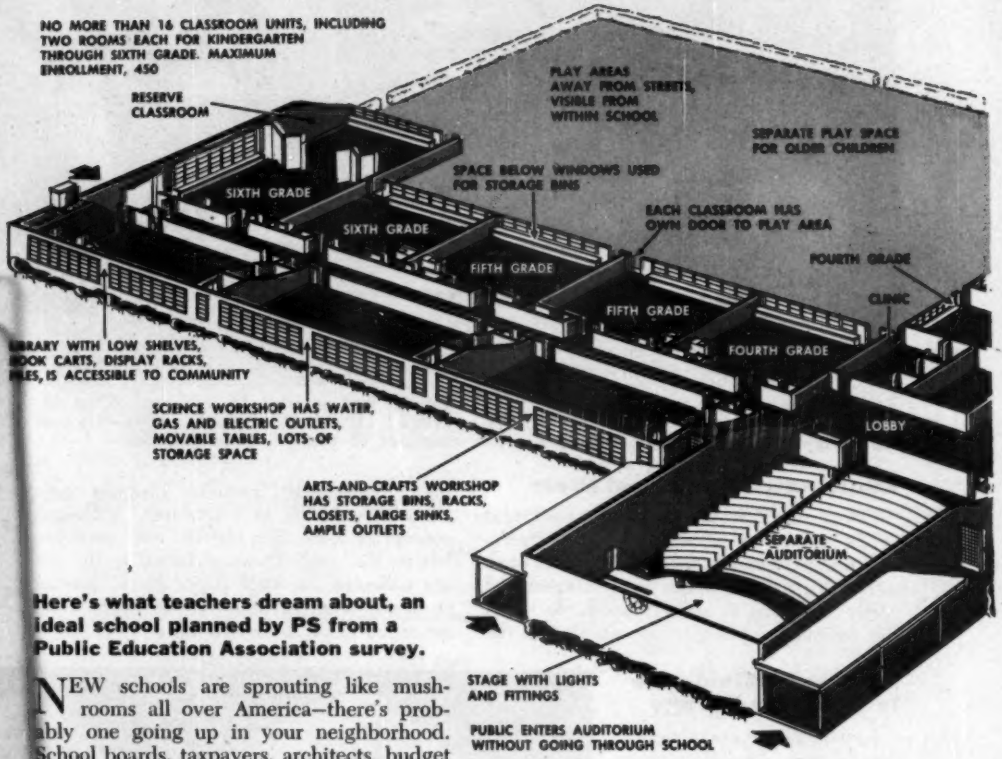
"HOT" tires now tell researchers how wear is affected by speed, air pressure, temperature and road condition. Ordinary tires must roll at least 5,000 miles in prolonged and costly test runs to show measurable wear. But radioactive phosphorus, mixed with the tread compound, permits gauging tiny amounts worn off in a few feet. A Geiger counter or X-ray film checks "hot" particles left on the road. Those scattered in the air are collected on filter paper by a test-car air scoop and vacuum-cleaner hose, then measured in the Goodrich lab.

Shelter of Aluminum Is Tent—or Garage

LIGHTWEIGHT and tougher than canvas, the all-purpose aluminum shelter at right makes a serviceable tent, garage or storehouse for soldiers or civilians. Walls tilt outward to provide cross ventilation, or to aid in storing materials. Adding sections forms a long room for use as a barracks.

Interlocking joints patented by the maker, the Wellward Tool Co., of Detroit, Mich., make the erected structure waterproof, draftproof and bugproof as well as fireproof. Sheet-aluminum members fold accordion-style for shipping.

Will Your Town



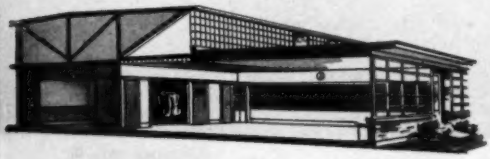
Here's what teachers dream about, an ideal school planned by PS from a Public Education Association survey.

NEW schools are sprouting like mushrooms all over America—there's probably one going up in your neighborhood. School boards, taxpayers, architects, budget directors, parents, everybody takes a hand in planning them. Everybody, that is, except the underpaid lady who is going to spend the rest of her working life in the school: Miss Smith, the teacher.

That's why this school is different. It's designed for just one thing: to show what all the Miss Smiths would put in a new school if *they* had the chance to plan it. The features shown are the highlights of what teachers asked for in a survey by the Public Education Association.

It's a dream school—but the teachers have a lot more than whim to back up their wants. They like the size limited, for example, to keep the school homelike and small enough so teachers can get to know the pupils. They want a one-story building so kids can step right from each classroom into the play area—and so handicapped children won't have to climb stairs.

Washable walls and floors and bright cheerful colors are important to teachers who have to keep house in the classroom Modern teaching methods make lots of stor-

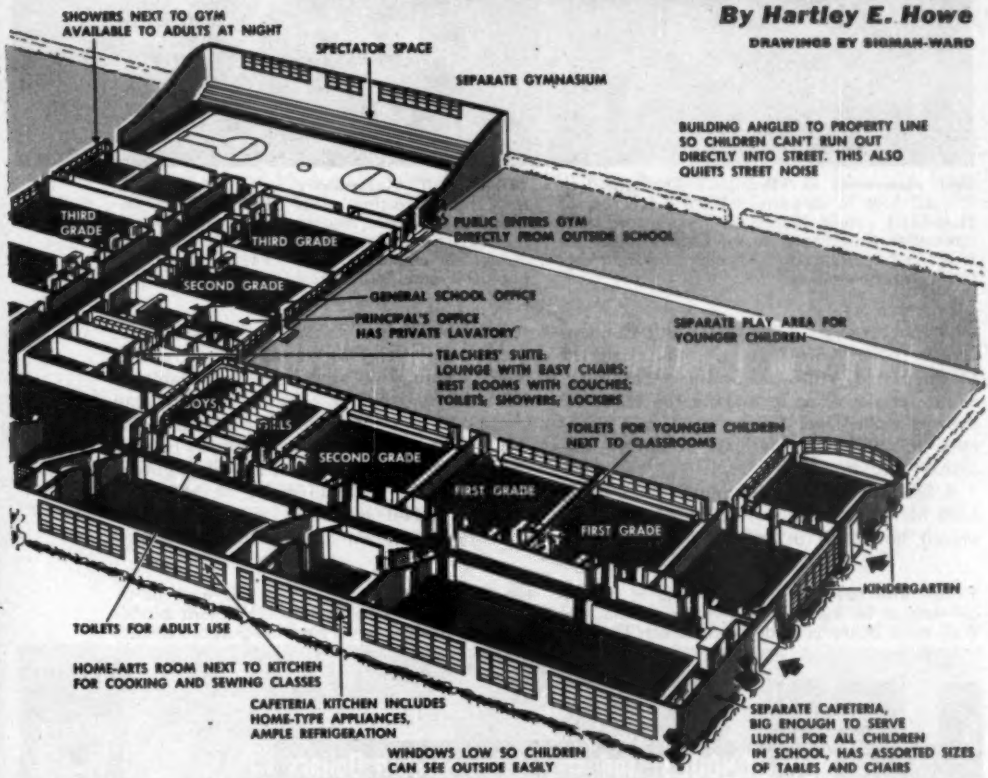


Classroom is equivalent of 48 by 28 feet. Raised center roof faced with glass brick to throw light on inner third of room is one answer to request for even, glareless lighting.

Build This School?

By Hartley E. Howe

DRAWINGS BY SIGMAN-WARD



Dream school illustrates highlights of the features that teachers want. An alternate arrangement would put library and cafeteria flanking auditorium, where they would be readily available for adult use from front entrances. Building was planned by designer Carl Sigman.

age space and movable furniture highly desirable. They like radiant heat because it saves space and because children can't burn themselves on hot radiators. And they want separate thermostats in each classroom for even heating.

Can One Room Do Two Jobs?

An auditorium separate from the gymnasium is emphasized by the teachers, who say one room just can't do both jobs properly—not to mention the time lost in rearranging the room several times a day. Both of these, as well as the library, cafeteria and workshops, should be planned for easy access from outside the building. This makes the school facilities available to adult groups without the confusion of people trooping past the classrooms.

There probably aren't many communities that can afford *all* the things the teachers want. But many of these ideas are going into

NEW SCHOOLS: Research Helps Make Them Brighter

Test classroom in Michigan's Daylight Lab is used here to measure surface brightness of glass-block panels. Meters on desks record light intensities throughout room. Cables raise and lower ceiling in sections so effect on light diffusion can be studied.

"Black-wall" laboratory next to classroom tests light-directing glass blocks under controlled conditions. Above, light from block is recorded by photocell that moves on hoop to check all angles. Selsyn motors move both photocell and "sun" shown in photo at right.

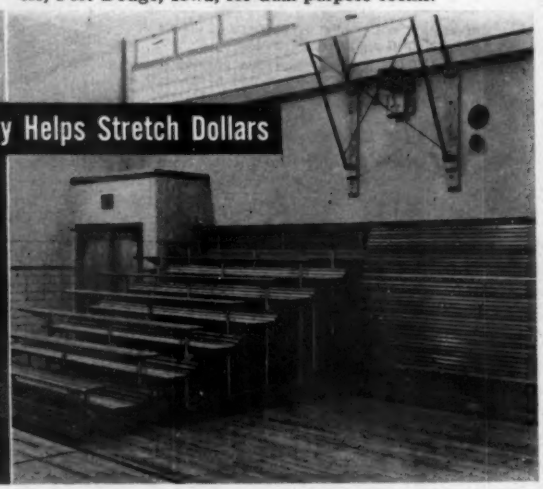
new schools right now. The South Elementary School at New Caanan, Conn., designed by Sherwood, Mills and Smith of Stamford, Conn., comes close to making the teachers' dreams come true. It was used as a reference in planning POPULAR SCIENCE's imaginary building.

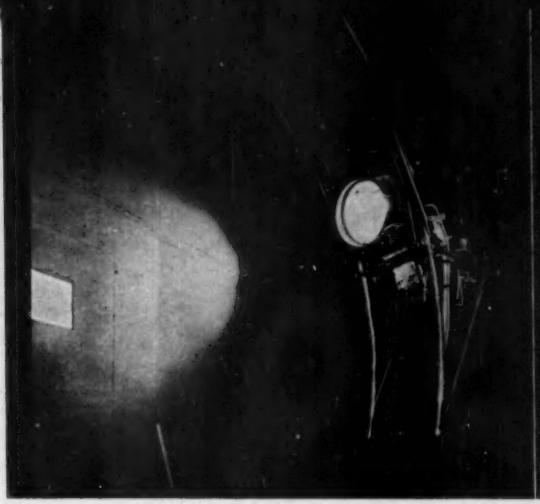
A big factor in making many new schools both pleasanter and more efficient is the research going on in everything related to school buildings. Lighting, for example, used to be pretty much taken for granted. Now, not only do such industrial giants as GE and Westinghouse carry on elaborate studies to perfect glareless artificial light, but the sun itself is being made to behave in the classroom. Studies at the Daylighting Laboratory at the University of Michigan have produced such new products as the glass block, shown above, that distributes

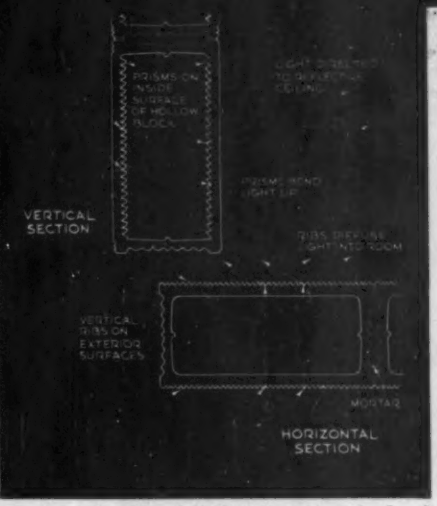
Tables and benches fold into wall to permit cafeteria to be used for gym or auditorium. In-Wall table below is made by Schieber, Detroit.

Grandstands can also vanish into wall, as in folding bleachers below, made by Horn Brothers, Fort Dodge, Iowa, for dual-purpose rooms.

NEW SCHOOLS: Industry Helps Stretch Dollars







On other side of black wall, 5,000-watt lamp provides "sun" for block tests, rides tracks to match sun's angle at different times of day and year. Daylighting Lab developed new Insulux 363 block, diagrammed at right above, for American Structural Products.

In new Insulux 363 block, inner ribs bend sun's rays up to ceiling; up-and-down outer ribs direct rays straight across block so no light is cut off by mortar at ends, then diffuse light horizontally so that glare is reduced and ends of room are evenly illuminated.

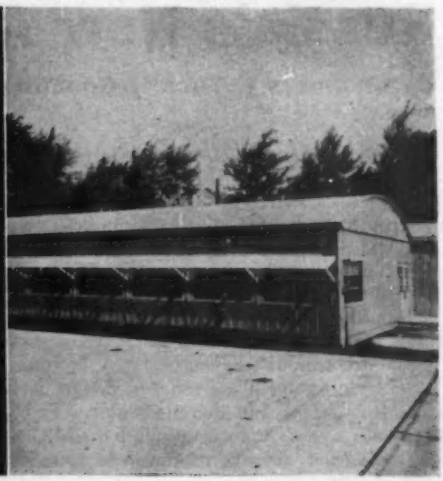
light evenly in a room while cutting glare.

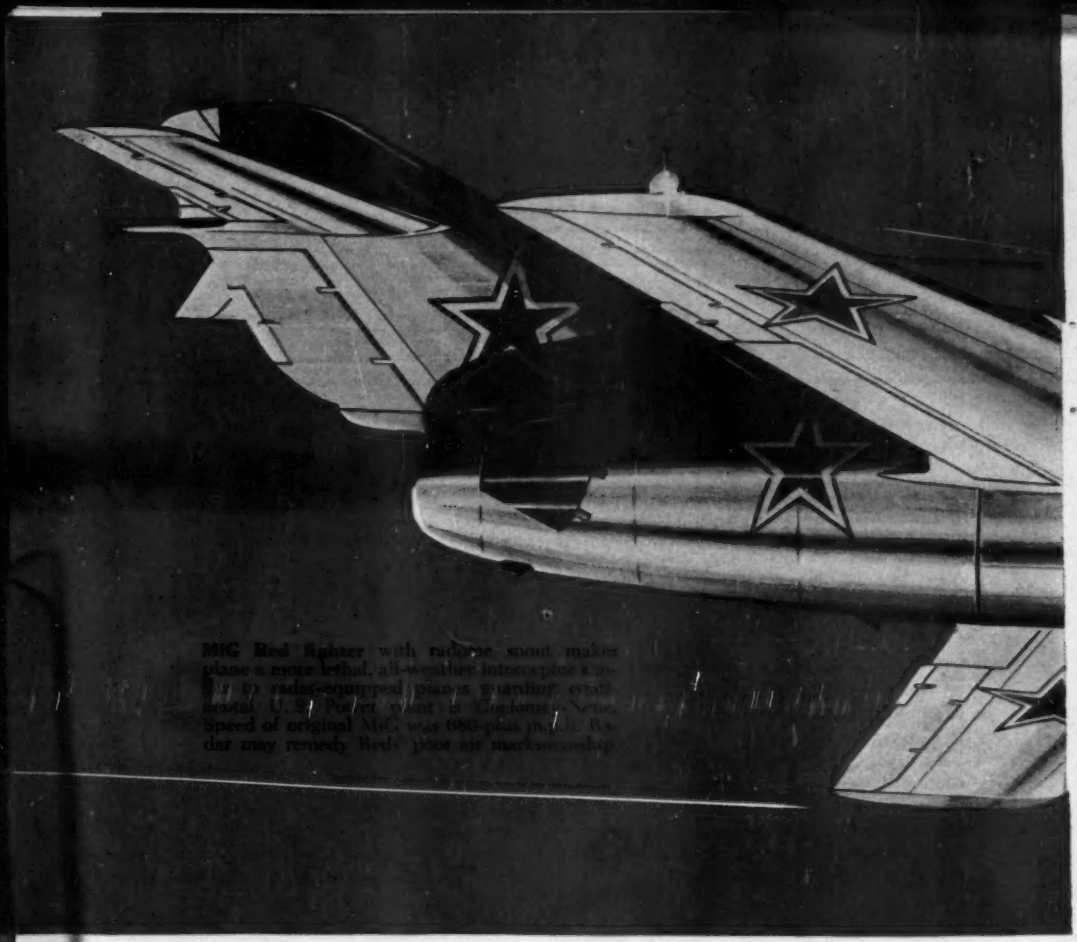
Meanwhile, industry has also come to the rescue of hard-pressed communities trying to make two schools grow where one grew before. Teachers may not like dual-purpose rooms, but they often permit features to be included that otherwise would be left out entirely. Tables that disappear into the wall, vanishing grandstands, blackboards that flip over to become easels or display panels—all help make one room do two jobs. Prefabrication is another dollar stretcher—prefabricated desk-chair units, prefab closets, even entire prefab schools.

We're going to need all the help we can get in building schools. By 1960, the experts predict, there will be over *seven million* more school children than there are now. That's a lot of kids—and it will take more than dreams to give them schools.

Seat and desk of combined unit, made by American Seating Co., Grand Rapids, adjust in height; chair swivels, desk top can be angled.

Prefab building, made by Blaw-Knox, Blawnox, Pa., permits quick school expansion. Insulated steel panels make any size building.





MiG Red fighter with radome snout makes plane a more lethal, all-weather interceptor similar to radar-equipped planes guarding continental U. S. Power plant is Coolomer-Nene. Speed of original MiG was 680-plus mph. Radar may remedy Reds' poor air marksmanship.

Russia's New All-Weather Jets

By Chalmers ("Slick") Goodlin
Noted Test Pilot

RUSSIA has taken another step to fend off atomic bombers if war comes. Two types of its first-line jet fighters are being equipped with the same kind of all-weather radar used by U. S. interception fighters.

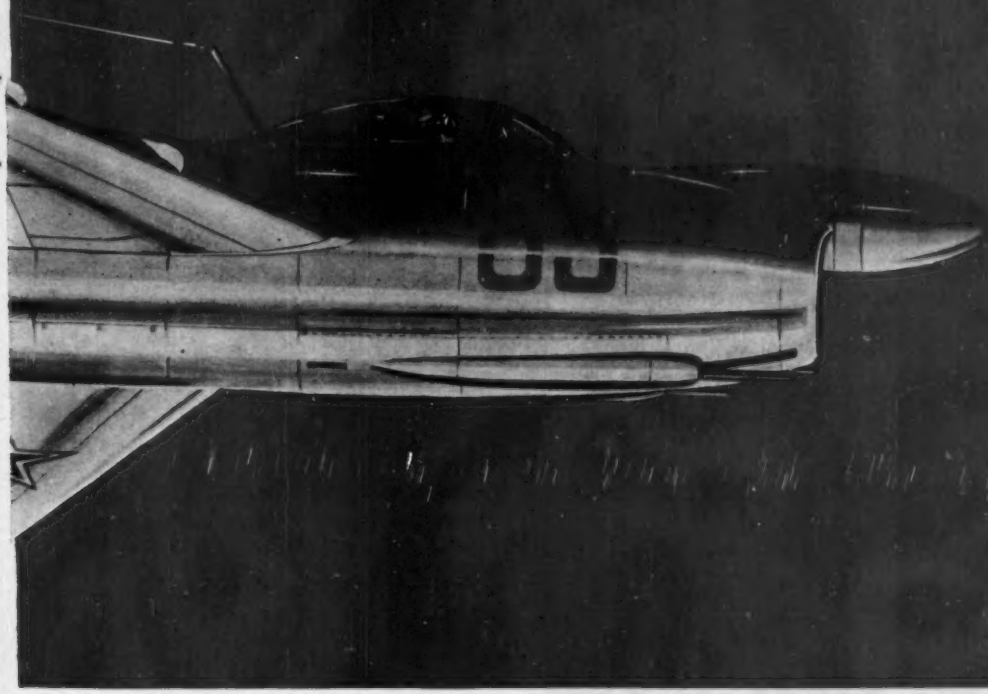
Fighter-borne radar has two functions—it searches out an enemy when pilots have to fly blind, and it sights the guns so pilots know when to press the trigger.

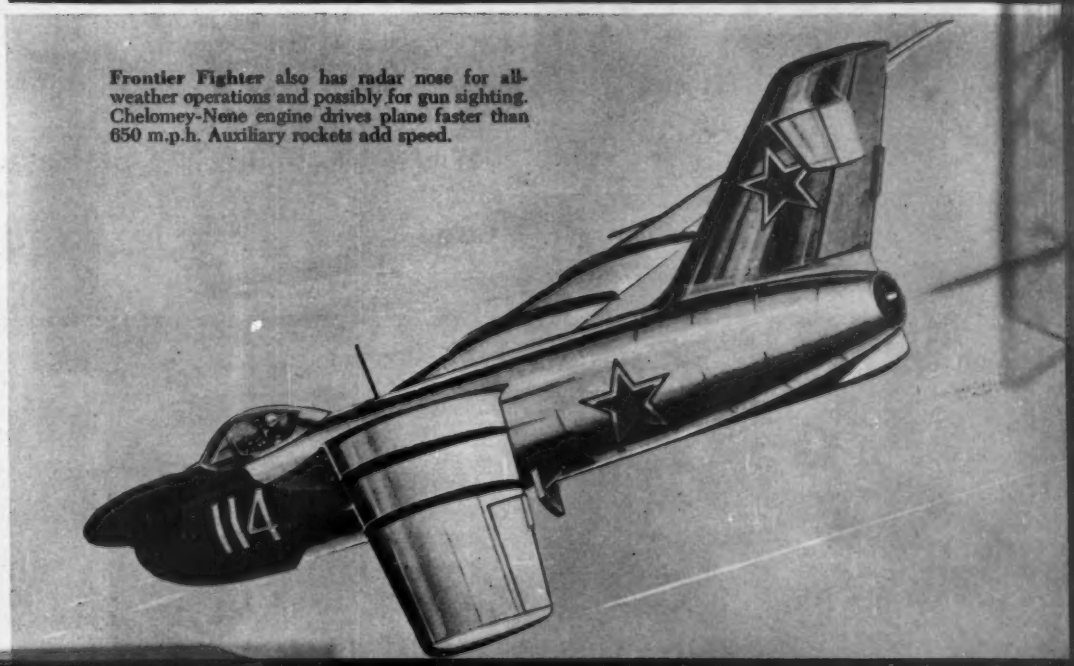
America undoubtedly is ahead of the U.S.S.R. in fighter-plane radar to protect its cities from attack, but there is evidence that the Reds may be catching up. Both the MiG-15 Russian jet, seen in profusion in Korea, and the La-17 Frontier Fighter are now being flown in Russia with radar snouts like those on the U. S. F-94 and F-86. (See "I Flew With Our Jet Defenders," PS, Apr. '51, p. 98.)

This isn't Russia's first move to protect itself against air attack. It is known that the Reds have an early-warning radar system. Whether they have a second necessary element—radar for directing intercepts from the ground—is not known. But certainly they have the third—radar for air intercepts.

The only apparent shortcoming of the MiG has been its poor sighting equipment. The radar snout, developed from a German wartime project, probably will remedy that.

With radar in its fast fighters, the Red air force is
preparing to beat all any attacks on the [illegible]
homeland regardless of flying conditions





Frontier Fighter also has radar nose for all-weather operations and possibly for gun sighting. Chelomey-Nene engine drives plane faster than 650 m.p.h. Auxiliary rockets add speed.

Jet Planes Start Each Other

STARTING a jet engine with another's blast is a trick worked out at Korean bases lacking sufficient starting units. F-86 fighters are lined up as above. Exhaust from one enters the other's intake, whirling its engine to firing speed.

One-Leg Desk Is Portable

EASY-CHAIR comfort for writers and students is provided by the portable British-made writing desk above. Held across the two arms of a chair, it is supported in front by a single adjustable leg. Ash trays slide out from each side.

Highway Bus Takes to Rails

COMMUTERS in rural Germany may soon board a bus in front of their homes, ride it to the nearest railroad, then stay aboard while the bus climbs on the rails and takes them into the city. A ramp (left) helps the bus get on the regular railroad truck that supports its front end. Another set of railroad wheels guides the coach's rear wheels, which rest on the tracks and provide traction just as they do on the highway.

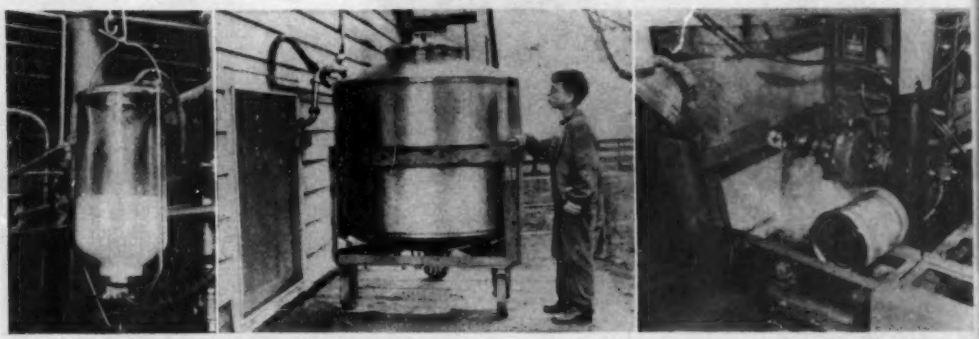
This German version of the rail-or-road bus is the latest of several that have followed the introduction of the idea 20 years ago, when the British demonstrated a vehicle called the Ro-Railer (PS, April '31, p. 33).

Aid for Back-Yard Golf Practice

SWAT the golf ball hitched to this device and it arcs into one of the slots at the top of the gadget, indicating whether the shot was straight, hooked, sliced or out-of-bounds. A calibration chart computes distance. A. E. Peterson Co., Glendale, Calif., makes the new device.

'Cycle Engine Powers British Car

THIS British rear-engine car is powered by a twin-cylinder, 500 c.c. (30.5 cu.in.) B.S.A. motorcycle engine. It was custom-built for entry in a competitive car rally in England and is said to be capable of doing 75 miles per hour and delivering 55 miles on a gallon of gasoline.



GIs Get Canned Fresh Milk

NATURAL milk now comes in cans. Although its high price keeps it from competing with bottled milk at home, 2,000 gallons a day are canned for troops in Alaska and Japan. At an East Stanwood, Wash., plant, the first of its kind, vacuum draws the cows milk into bottles (left above), then to a tank (center). After sterilization—instead of pasteurization—and canning (right), the product stays sweet for six to 12 months without chilling.

What *COLOR* Does to *TV*

THE STUDIO More lights, placed lower, is major change on CBS color set where Director Frances Buss (left), Ed Sullivan, Patty Painter discuss script.

Everyday color television is on the air, adding pleasure for the audience —and some problems for producers.

By Kendall W. Goodwyn

YOU'LL see more on your TV screen, whether it's big or small, when you've converted to color. But putting the color into the pictures poses new problems that producers and engineers are busy solving now.

Shows already being telecast and others being planned prove what color does to television. What it does is good. More than simply adding beauty and realism to a gray picture, it makes possible scenes and whole shows that black-and-white would miss.

Take the impressive program that inaugurated commercial color TV this summer. In one sequence of a ballet, the dancer relinquished her bouquet of red roses for one of black roses, signifying death. In black-and-white, the whole scene would have been meaningless.

And the regular, everyday programs that followed the big "Premiere" hour on the Columbia Broadcasting System, while not so lavish with high-priced talent, have also demonstrated what color can do. Naturalist Ivan T. Sanderson shows you the brilliant feathers of exotic birds or explains why Nature gave unusual tropical plants their strange shapes.

Color Helps You Identify Objects

This fall there will be plays, children's programs, football games. Outdoor sports events come through very effectively in color. And you can always tell which team is which just by the colors of the uniforms.

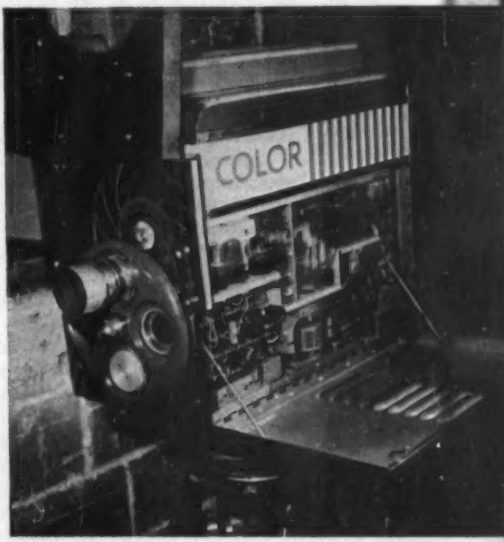
Science demonstrations are another natural subject for color television. Already one series is being prepared with the cooperation of Kenneth M. Swezey, well known to POPULAR SCIENCE readers for his regular home-experiment articles.

Working independently of CBS with science expert Dr. Gerald Wendt and two young producers, Harvey Cort and Milton Subotsky, Swezey is providing the material for short movies that explain the everyday applications of science.

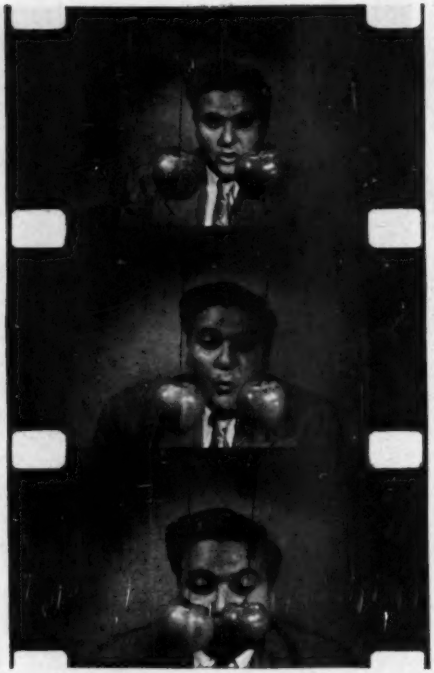
Color Films Can Be Used

Color television can reproduce 16-mm. color film, such as Cort and Subotsky use, or 35-mm. films. The shows now being

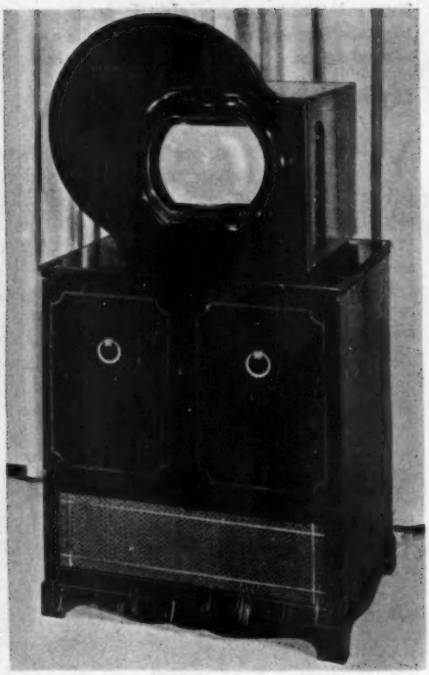
THE CONTROLS An extra panel (extreme right in photo above) adjusts the color-wheel motor and color balance in each camera. The technician's hand is on the knob that sets the amount of red in the picture. Adjacent knobs control blue, green.



THE CAMERA Only when covers are opened can alterations that convert camera to color be seen. Twelve-segment filter disk (above lens turret) spins on long shaft running through camera to motor in rear. Viewfinder shows black-and-white picture.



Scene from "How an Airplane Flies"—one of science films being made for color TV—shows how air blown between apples creates low-pressure area that sucks apples together. Color in such shows heightens interest, lets you actually see chemical changes, wildlife beauty.



Color slave unit developed by Crosley for its receivers can be attached to current models by making two simple connections. Slave shows 12¾-inch color picture magnified from its own 10-inch tube. It also has separate controls for brightness, focus, hold and contrast.

telecast by CBS, however, are not films, but "live."

Are they harder to put on than black-and-white? "We've adapted ourselves to color very quickly," says Frances Buss, the comely young woman who directs the Ivan Sanderson show. "Stage settings are hardly different from the black-and-white ones. Those are normally colored anyway, you know. Costuming may be easier—we only have to consider how colors blend, not how they reproduce as shades of gray."

Four Times as Much Light Needed

Another TV showman who expects color programs to be easier to handle is Worthington Miner, producer of such well known black-and-white presentations as "Studio One." He suggests, "An entire chorus of a song, for example, may be carried on a single setup in color without a sense of monotony . . . Camera setups might be reduced 25 to 30 percent . . ."

Studio engineers, too, find the change to color simple. Ted Lawrence, color-quality supervisor for CBS, points out, "The camera is basically a standard model. We've made some electronic changes and added a color disk and a small electric motor to turn it. The camera disk has 12 filter segments, instead of the six segments used in receivers, so that we can use a slower motor.

"We have to use about four times as much illumination because the red, green and blue filters on the camera absorb light," Lawrence adds. "Many lights are placed low, in order to keep the illumination—and the color—even. We usually have several reflectors at head height.

"Fluorescents? Sure, we can use them. Their uneven color spectrum doesn't bother color television the way it does color photography. Partly that's because the shaders can adjust the mixing controls to make, in effect, almost any type color 'emulsion' we need."

RCA COLOR Despite Government decision setting up CBS method as only regular color TV system, RCA began tests of its rival technique this summer. RCA color has advantage of "compatibility"—existing receivers require no modification to pick up colorcast in black-and-white. New Yorkers who have thus received monochrome views of RCA's colorcasts have found the quality excellent. Newspapermen who witnessed demonstrations of RCA color receivers this summer also praised the color tube's performance.

The "shaders" are technicians who keep the picture quality in adjustment. For color work, they have three extra knobs marked red, green and blue that vary the strength of the primary colors to maintain true-to-life colors in the final picture.

Transmitted Like Black-and-White

Once the colorvision signal gets past the studio control room, it is handled in the same way as black-and-white. Telephone wires carry it to CBS "master control," which pipes it to the local transmitter and may also feed it to the coaxial cable or microwave relay for networking. The ride on the coaxial cable doesn't harm it.

While the people who produce TV shows oh and ah over color, the people who produce TV receivers moan and groan. Now that CBS color is here, they say, the public has stopped buying their sets, which cannot receive CBS color without internal changes.

The big manufacturers have bitterly fought Columbia's color system. But now one major company, Crosley, has announced a color slave—a separate cabinet with picture tube, color wheel and circuits that can be plugged into Crosley receivers. However, the unit is not yet in production.

Color TV Is Here to Stay

Other manufacturers, hints industry gossip, are about to include built-in adapters in sets in production. These will enable the receivers to get color programs in black-and-white and will simplify later conversion to full color.

CBS, through its recently purchased set-manufacturing subsidiary, will have color receivers in the stores this fall. Dozens of smaller electronics firms are scrambling to get on the bandwagon. So there's sure to be equipment to bring to the public the beautiful full-color television that, after many years of false starts, is finally on the air. END

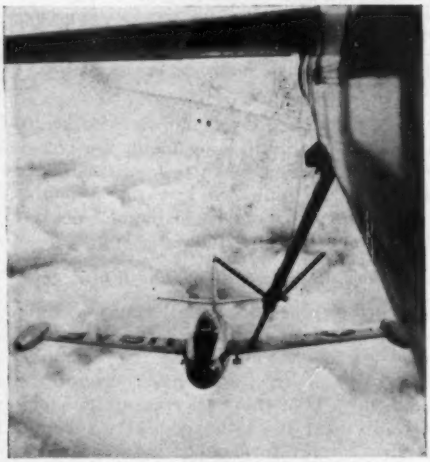
One-Man Machine Moves Houses

WITH this outsize contraption, called the Tournamover, one man can pick up a house and set it down in a new location in record time. The wheelbase of the four-wheeled tractor-trailer is 38 feet; the over-all length 50 feet, eight inches. The total weight is 31 tons.

An electric power system, supplied by the tractor's 180-hp. Diesel engine, is necessary to operate the mover. Motors hoist a house onto the trailer and level it. Another motor is required to steer the tractor on account of the huge weight of the machine and its load. The manufacturer is R. G. LeTourneau, Inc., Peoria, Ill.

Biggest Glass Boat Launched

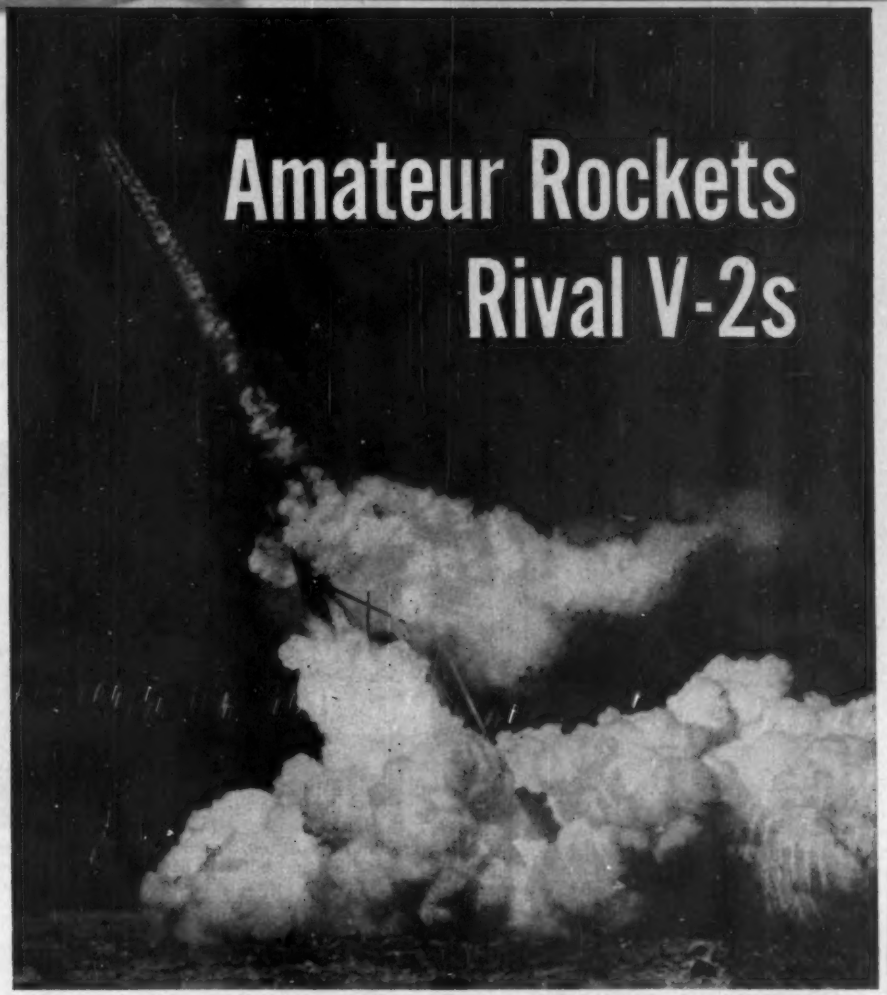
PEOPLE who live in glass houses . . . can now have yachts to match. This 42-foot ketch, built by Anchorage Plastics Corp., of Warren, R. I., is the largest ever made of Fiberglas—impervious to salt water, sunlight, termites, barnacles and rot. It is much lighter than a wooden boat of like size.



Mid-Air Refueling Routine for New Jet

REPUBLIC's F-84G Thunderjet is the first operational jet fighter to roll off the production line equipped for in-flight refueling—increasing its range and hitting power. Other improvements over its battle-tested sister ship, the F-84E, include an automatic pilot and a more powerful Allison engine.

Amateur Rockets Rival V-2s



White smoke from fast-burning solid fuel spreads over Mojave Desert as rocket takes off.

Tests now being held on the barren sands of the Mojave Desert may point the way to future interplanetary travel.

By Andrew R. Boone

EVERYBODY holds his breath. All eyes are focused on the launching tower. And here comes the count-down: "Three . . . two . . . one . . . zero. Fire!"

Wham! The stillness of the Mojave Desert is shattered by an explosion of fire and white smoke. Jack rabbits turn tail and a frightened coyote scurries away as a slender projectile streaks up into the blue sky.

The rocketeers are at it again.

Members of two enthusiastic organizations that build and launch their own rockets—the Pacific Rocket Society and the Reaction Research Society—these amateur rocket scientists range in age and training from high-school students to physicists and aeronautical engineers. Four times a year, 250 strong, they meet in the desert with their beautifully machined creations to indulge in their unique hobby.

All the Drama of the V-2s

The dramatic launchings lack none of the color associated with the big V-2 and Viking rockets at White Sands. The same precise measurement of propellants. Warning to the trackers, waiting beside their recording theodolites out in the sagebrush. Observers safely stationed in a blockhouse.

Then the explosion—a secret mixture of

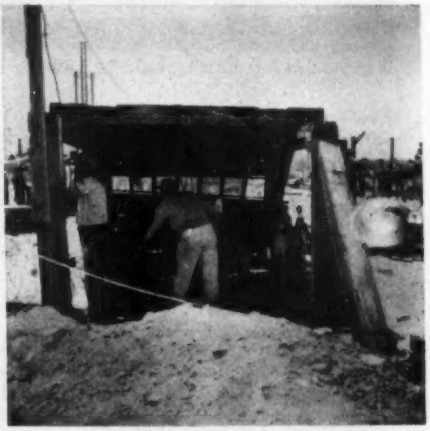
Preparation of solid propellant starts with rolling and gluing tube of cardboard to fit snugly within rocket-engine barrel. When dry, tube is cut into short capsules.

Each capsule for 2½-inch rocket must contain exactly 100 grams of powder, a mixture of zinc dust and sulfur. Each charge is balanced against one that has been weighed.

Parachute is packed carefully into nose section. Powder charge explodes nose from engine, and another charge blows 'chute out to bring recording instruments down safely.

Members of both societies labor for months designing and building new rockets. Here Carroll Evans, president of Reaction Research Society, sands down maple nose of rocket.

Ed Sawyer (right), technical director for the Pacific Rocket Society, moves his seven-foot stainless-steel rocket into launcher. Ready to fly, rocket weighs 18 pounds.



Test crew is protected by shelter built from old bridge timbers and bulletproof glass. Panel connects warning siren, distant trackers, loudspeakers and firing circuit.

zinc dust and sulfur propels the rocket heavenward with a 10G acceleration. In six-tenths of a second, the propellant burns out. Upward the slender tube soars, trailing smoke from its nostrils. It rises more than a mile, arcs over, breaks in two. A parachute, kicked out by a tiny powder charge, blossoms. Down to safety rides the nose section, bearing inside it twin recording altimeters.

Rocket Climbs Four Miles

Although the work of amateurs, these rockets are far from toys. They perform just like the big ones. Altitude record to date: slightly better than four miles. That mark was hit in mid-June by a two-stage, nine-foot stainless-steel and aluminum missile built by Jim Nuding, North American Aviation researcher. Including propellants, it tilted the scales at 38 pounds. Solid fuels in the booster engine jumped the rocket off with a 12G acceleration. Thiokol (a synthetic rubber) and liquid oxygen kept it climbing after the booster fell away.

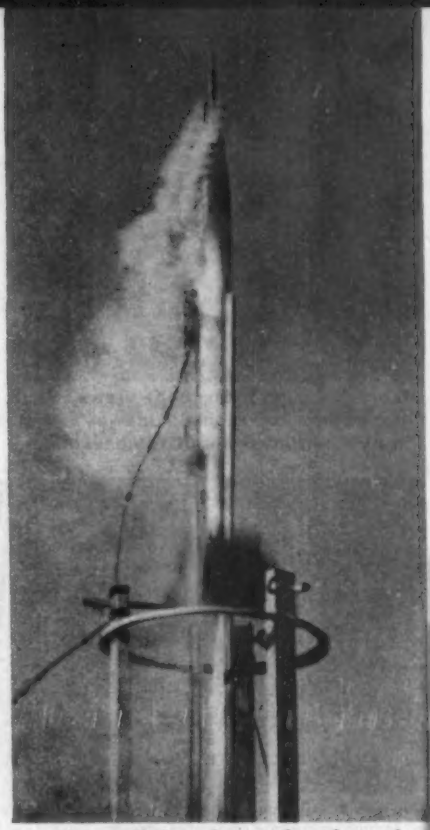
Whereas the Navy may spend millions to launch and record the performance of a Viking, a twenty-dollar bill will cover the materials going into the average amateur rocket flown on the Mojave.

Theories on Fuels Differ

Both societies have the same aim—ultimate promotion of interplanetary travel—but they differ in the kinds of fuel they employ in their rockets. The Reaction Research Society relies on solid propellants. By careful and repeated trials, its members have evolved what they call a micrograin mixture of zinc dust and sulfur. Fired electrically, a column of the stuff five feet long burns in half a second. Acceleration of a 15-pound rocket to maximum speed is virtually instantaneous.

The Pacific Rocket Society, accepting slower acceleration but seeking longer range, uses a variety of liquids. The propellant may be butane, propane, cellulose and ceresin wax, or alcohol, with liquid oxygen as the oxidizer.

The rockets are not scale models of anything yet built. All are slender tubes, but there the similarity ends. One rocket may be stainless steel with an aluminum nose; another aluminum and steel with a nose turned from wood. At this writing, more than 100 have been launched.



Liquid-propelled rocket trails only a short flame as it shoots straight up from launcher. By the time it reaches an altitude of 2,000 feet, rocket will be traveling 800 m.p.h.

Looking to the future, PRS members have built a model designed to fire rockets in seven steps. It's intended to reach the moon. Nor have they overlooked the problem of landing on the lunar surface. With mathematical calculations complete, and building started, they will launch during the coming months a rocket fitted with retro-rockets.

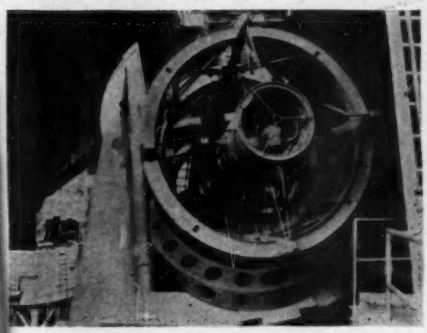
Retro-Rockets Act as Brakes

These rockets, which fire forward, are intended to bring the landing speed to less than 20 m.p.h. The retro-rockets will be set off by a tiny radar set operating a tripping mechanism when the missile is only 100 feet or so above the surface on which it is going to land.

Meanwhile, new and more potent propellants are coming along, and the rocketeers will be trying them out in their desert laboratory. Pity the poor jack rabbit—he's in for a rough time. END

Big Booms in the Sky

World's largest telescope views titanic explosions and clocks runaway nebulas in new explorations of the heavens.



Observer just visible at center of Palomar's 200-inch telescope indicates its size.

SUPERNOVA known as Crab Nebula is seen above through 200-inch telescope. Bright mass of luminous gas is rushing outward at 800 miles a second in one of greatest explosions ever observed.

THROUGH the world's most powerful telescope, the 200-incher on Mount Palomar in California, astronomers are watching the biggest explosions in recorded history.

Supernovas, or king-size exploding stars, provide the celestial spectacles. They flare to billions of times their former brightness and blow up. When this takes place in our own galaxy, the Milky Way, observers get a ringside view.

The last three appearances of Milky Way supernovas were in the years 1054, 1572 and 1604. Another is believed about due. But astronomers who want to see the rare and awesome spectacle needn't bite their nails and wait for it to happen.

Blowup Has Gone On 900 Years

So titanic is a supernova's blowup that even the one of 1054 is still going on—almost nine centuries after it was first observed by Chinese astronomers. Today it has formed a gigantic cloud of luminous gas, the Crab Nebula, in the constellation of Taurus, the Bull. The gas is rushing outward at the explosive speed of 800 miles a second, the 200-inch telescope reveals, and will eventually vanish into space. Only a faint central star, probably leftover debris, will remain.

Why does a supernova blow up? Some astronomers hold that the explosion may be a nuclear chain reaction—more or less like an atom bomb's, but on a scale that's out of this world. For it would take billions of billions of atom bombs, they estimate, to match a supernova's blast. Photographs on these pages visualize the contrast.

One, a Palomar photo, shows the Crab Nebula today. The other is the most recently released photo of an atomic blast. Total official information about it is the terse description: "Atomic Explosion, Frenchman's Flat, Nevada, U.S.A.E.C. Test Program, January-February 1951." The Atomic Energy Commission won't comment on whether its unusual appearance hints a new A-weapon, nor confirm guesses as to its size, which

A-BLAST above may be tiny sample of what happens when a whole star blows up and forms a supernova. Striking photo by Los Alamos Scientific Laboratory shows a recent atomic explosion during tests in Nevada.

range all the way from one of the smallest to one of the biggest A-blasts yet. Only one fact is sure—it's a peanut-size explosion compared to the ones up in the stars.

Did the world begin with the biggest bang of all? As if from a primeval explosion, heavenly bodies are rushing outward into space, according to the widely held theory of an expanding universe. Their actual velocity can be measured, the theory holds, by observations of a spectroscopic phenomenon called the "red shift."

Big Eye Sees Farther

The 200-inch telescope has extended these measurements to nebulas half again as distant as could be clocked before. As far as it can peer, their observed velocity increases directly with their distance—the same speed-distance relationship earlier found for "runaway" nebulas at closer range. Fantastic speeds measured with the big "eye" range up to more than one-fifth the speed of light.

Electron Microscope Tells Inside Story of Grease

UNDER an electron microscope, blobs of grease magnified 32,000 times are yielding their secrets to researchers. Twisted filaments and wormlike pellets, made visible by the powerful electronic lens, guide them in seeking better greases for cars, airplanes and industrial machines. A mixture of mineral oil and soap provides grease that sticks tightly to surfaces under heat and pressure. How well it does a particular job depends upon the size and shape of the soap fibers in it.

Gold Plate Adds Third Dimension

To get a look at these soap fibers, California Research Corp. chemists place samples of new greases in a vacuum jar. Inside the jar, an electric current vaporizes a piece of gold wire (photo above), depositing a coating of the metal on the fibers. Viewed with the electron microscope, the gold-plated soap fibers stand out in three-dimensional relief. Long fibers with a twist imparted by stirring during manufacture make the best automotive grease. Short, thick ones are better for heavy machinery.

Gold plating shows long, twisted soap fibers in auto grease, magnified 32,000 times.

Here's what Makes Me Tough

1. Plastic covers on the cell connectors prevent accidental short circuits.
2. Perforated cell protector guards elements against injury from hydrometer.
3. New grid alloy containing silver lasts longer.
4. Tough plastic separators are acid- and heat-resistant.
5. Improved oxide on positive plates packs more power per ounce.
6. Retainers are glass fiber coated with plastic.

"Bet I'm the Toughest Battery in Town!"

New materials and methods have yielded a battery that will last longer than you are likely to own any one car.

By George H. Waltz, Jr.

YOU will no longer have to buy a new car battery every two or three years. That's the promise held out by a new long-life storage battery that has just started coming off the assembly lines.

How long this battery, called the Exide Ultra-Start, will last, no one knows—it hasn't been around long enough. But rugged laboratory and road tests have convinced the engineers at the Electric Storage Battery Company, which is producing it, that it will last *"for years and years, certainly longer than the average person owns any one car."*

The Ultra-Start is the result of 40 years of work on starting batteries. Before 1911, the only storage batteries in cars were small, low-drain ignition batteries, called "sparking cells." The few mechanical starters that were available as expensive accessories required no electric power. One used compressed air piped to each cylinder from a large storage tank, and another used a starting rope similar to the one on an outboard.

Starter in Search of a Battery

Then Charles "Boss" Kettering came up with the first practical electric starter. It required a rugged 24-volt storage battery. None was available.

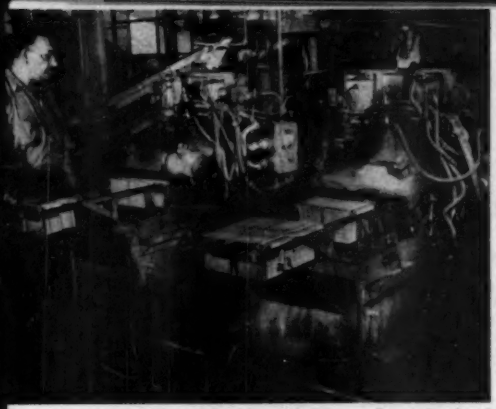
Ket appealed to the Electric Storage Battery Company in Philadelphia, then making automobile "sparking cells." The assignment went to Edgar Longaker, a 28-year-old designer who had helped the U. S. Navy design its first submarine storage battery. Within a few months, Longaker had designs for the first car-starting battery—a 12-cell job that met Boss Ket's specifications. The cells were arranged in four groups of three two-volt cells each and each cell had one positive plate and two negative plates.

Two Batteries in One

Because Ket's new starter required 24 volts while a car ignition system needed only six, a tricky switching arrangement was used. For starting, the two-volt cells were connected in series to yield 24 volts. For ignition purposes, they were broken up into four series groups connected in parallel to provide six volts.

Two years later, in 1913, a three-cell battery that would do the job was developed,

Molded-plastic covers that fit over cell connectors eliminate accidental shortings by carelessly placed tools. Voltage tester can be inserted through slots without removing covers.



Automatic casting machines produce the lead grids, or plates, for the new battery. A lead alloy containing silver and other components makes the grids last longer.

Pasting machines, which apply the active materials to the cast grids, also are completely automatic. Photo above shows active material and cast grids being fed into a machine.

Completed battery grids emerge from other end of the machine. Because an improved oxide is used on the plates, new battery has greater starting power throughout its life.

and improvements followed improvements, with the result that the battery you have in your car now weighs only about a fifth as much as a battery with equal cranking strength would have weighed in 1913.

Nevertheless, people have continued to demand more and more service from their car batteries. So the engineers have gone on striving to improve them, and now they have come up with a battery designed to resist abuse and to pack its starting punch for a longer time.

The Exide engineers haven't changed the basic principle of operation, but they have done a whole lot to bolster the battery's inner defenses against overcharging and the other things that wear batteries out.

Two-Way Energy Converter

The six-volt car battery operates on a take-and-give process. A reversible electrochemical reaction allows the cells to convert electrical energy into chemical energy and then to reconvert that chemical energy into electrical power when it is needed. When you start your car, your battery's positive and negative plates, immersed in a sulfuric acid and water solution, slowly change their chemical composition. Lead peroxide embedded in the grids of the positive plates reacts with the acid and slowly changes into lead sulfate. Similarly, the spongy form of lead that makes up the negative plates also slowly changes into lead sulfate. While this discharging is going on, the battery solution is getting weaker and weaker since the acid is combining with the two active materials.

On a drive, as your generator pumps current back into the cells, the lead sulfate

Perforated element protector in cell of new battery prevents injury to parts when hydrometer is inserted to test specific gravity.

on the plates slowly changes back into lead peroxide on the positive plates and spongy lead on the negative plates. At the same time, the sulfuric acid goes back into solution and increases its strength. The battery is then charging.

Takes More Than It Gives

Unfortunately, this take-and-give process is one of the things that wears the battery out. The lead and the lead peroxide are not deposited back on the plates in the same volume and at the same rate as they are removed. This results in depleted active material and grids eaten thin by the acid. Overcharging tends to speed up this wearing-out process.

How then did the Exide engineers go about producing a storage battery with a greatly increased life span? They did it, they explain, by improving battery materials and manufacturing methods and by adding a few safeguards against accidental injury.

First, they developed a new metal for the grids, or plates, consisting of lead together with silver and other components. The new alloy, because of its grain structure, resists attack by electrolysis, slowing the eating-away process and lengthening the life of the grids.

Packs More Punch Per Ounce

Second, a new method for processing the lead peroxide for use on the positive plates gives it more electrical wallop per ounce. The process is Exide's secret, but they will say that the changes in the oxide are physical rather than chemical, making it possible to cram in more effective active material without increasing the battery's size or weight.

Next the engineers came up with a new ribbed plastic separator—the spacer that separates positive and negative plates—called "Pormax." It is tough, flexible, acid- and heat-resistant, and has low electrical resistance.

As a test, a set of 42 of the new separators were used consecutively in three different batteries subjected to rigid life tests in the laboratory. Then these same separators were built into a fourth battery installed in an automobile. Under average driving, stopping and starting conditions, they gave 23 more months of satisfactory service. All told, those 42 Pormax separators had seen the equivalent of eight years of use in a car.

Between the separators and the positive plates the engineers have used Vitrex retainers to hold the active material in place. These are glass fiber coated with plastic for longer life.

Ed Longaker, now 68, points out the differences between the new battery and the first starter battery he invented in 1911. He plans to retire soon to get a "recharge," as he puts it, by raising chickens.

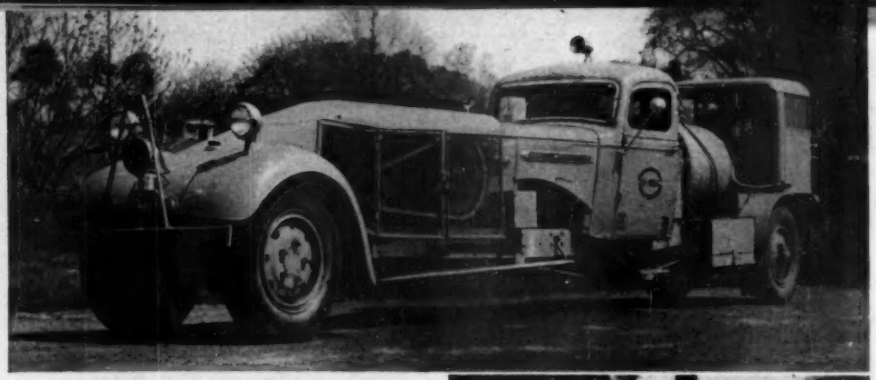
Gets Stronger Instead of Weaker

Finally, just as an added defense against premature battery failure, the designers lowered the specific gravity of the electrolyte from the conventional 1.280 at 80 deg. F. to 1.260. This means a lower acid content and therefore less chance of damage if the battery is overcharged. Furthermore, the lowered acidity plus the improved oxide causes the battery's cranking ability to increase rather than decrease during its early life. Test batteries have shown that they packed more of a starting punch after a year than when they were brand new.

The Ultra-Start even has built-in protection against carelessness. Removable plastic covers shield the links between cells to eliminate accidental shorting. A perforated protector below the top of each cell prevents anyone from jabbing a hydrometer into the filler hole and injuring the plates, separators or retainers. A new type of sealing compound used to cover the tops of the cells is said to be approximately seven times more resistant to cracking from vibration than previous compounds.

How Much Will It Cost?

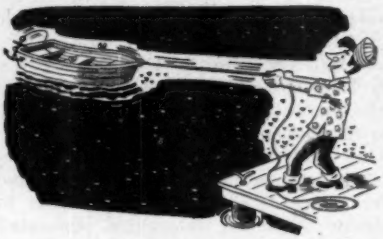
And what is this new long-life battery going to cost you and me? Just a few bucks more than the top-flight batteries now on the market. Stretch that out over a life that may outlast your car's and you've really got something. END



Gunsight Aims Paint Truck at Target

THE driver of this odd vehicle lays a white line right down the center of the highway by aiming his truck like a rifle. Sights are mounted on a bracket attached to the front bumper, as shown above. Another man operates the controls that force paint out under pressure. The tank holds 350 gallons of special paint mixed with tiny glass beads that increase its reflecting power. Two of the trucks are now being used by the Connecticut Highway Dept. to put the white lines on the state's 3,000 miles of road.

My Most Ingenious Solution



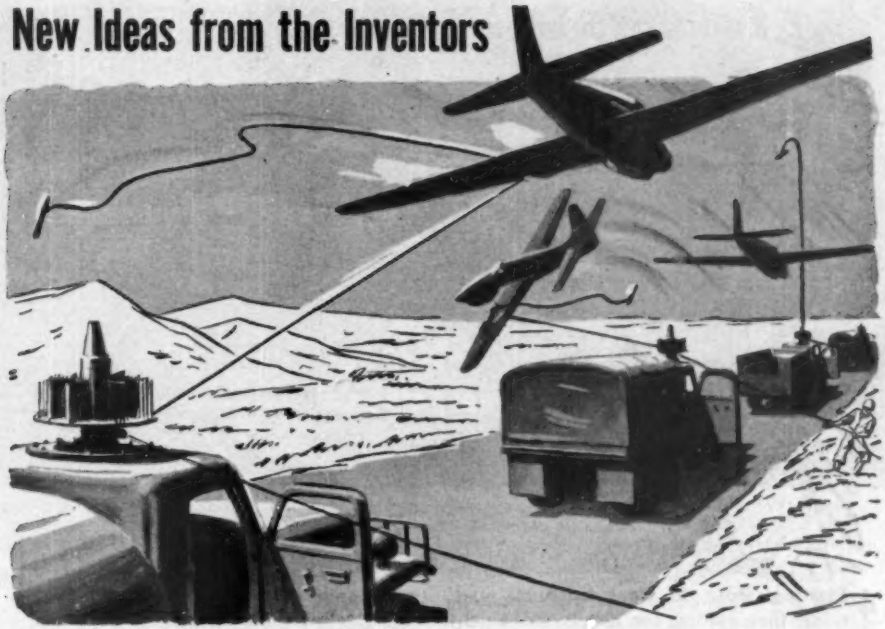
I like to moor my small boat away from our dock so the boat won't be aground at low tide. This called for wading to the dock after I had moored the boat—until I hit on this stunt. What do I do now?

When I reach the dock, I place the anchor on the very edge of the stern. Then I shove the boat—stern first—away from the dock, paying out the forward line as I do so. When the boat is far enough away from the dock, I give the line a jerk. This spills the anchor overboard. Then I tie the forward line to the dock. To retrieve the boat, I heave on the forward line and drag the anchor.—Everett L. Lord, Jr., Wickford, R. I.

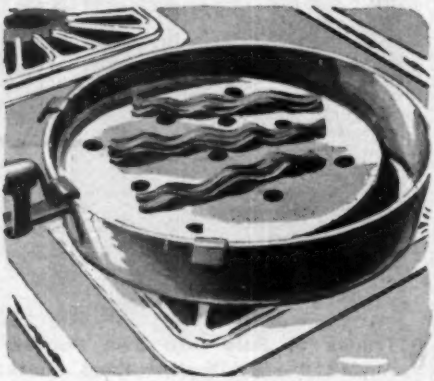
Don't Swat It—It's an Airplane

DWARFED beside a giant transport in the picture above, this tiny ship has an over-all length of 11 feet, a wingspread of 7½ feet and stands just three feet high. It is powered by an 85-hp. Continental engine. The 300-pound midget performs like a mosquito, according to Wilbur Staib, flying instructor of Diamond, Mo., who took three months to build it.

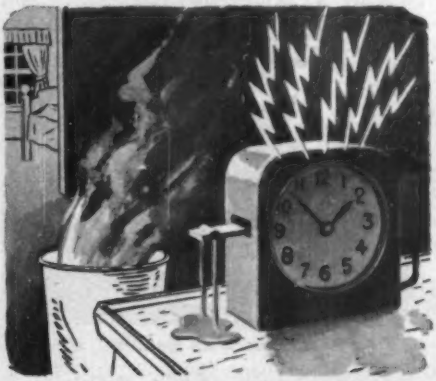
New Ideas from the Inventors



1 Antiaircraft Gun to Fire Cable. This cable gun is designed to let Army trucks defend themselves against strafing aircraft. It would shoot a long length of steel cable up into the path of the low-flying planes. The cable, wound on a reel that could spin around the gun barrel, is fastened to the projectile. As the shell leaves the gun, it would unwind the cable from the reel and pull it up into the air.



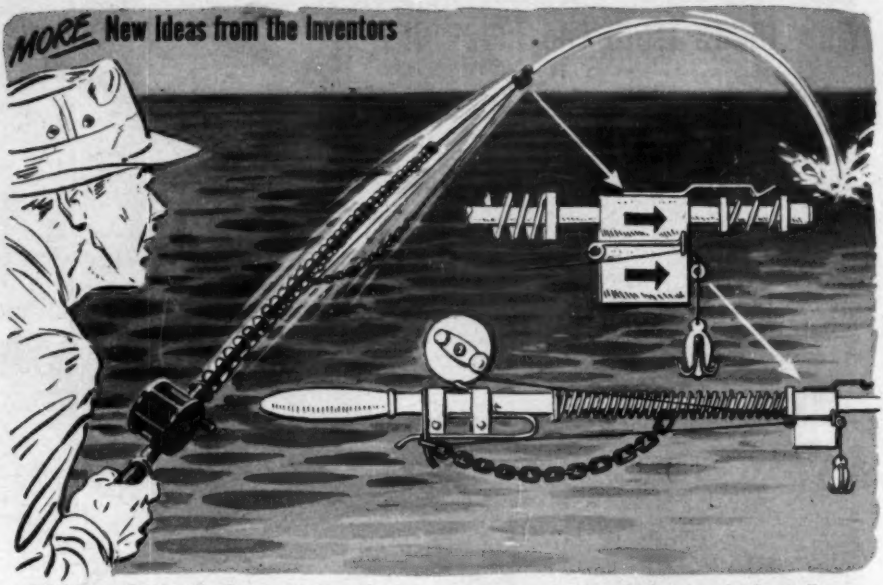
2 Pan to Drain Fried Foods. A perforated plate that can be placed inside a regular frying pan would make it easy to drain bacon and other fried foods. When the food is cooked, the inner bottom could be lifted up by a separate handle and hooked over the edge of the pan, letting the hot fat drain off through the perforations.



3 Clock to Serve as Fire Alarm. This electric alarm clock would not only get you up in the morning but also wake you during the night in case your house should catch on fire. The heat from the fire would melt a pellet of fusible material, closing two electrical contacts that set off the clock's regular alarm.

Turn the page, please, for three more new ideas.

MORE New Ideas from the Inventors

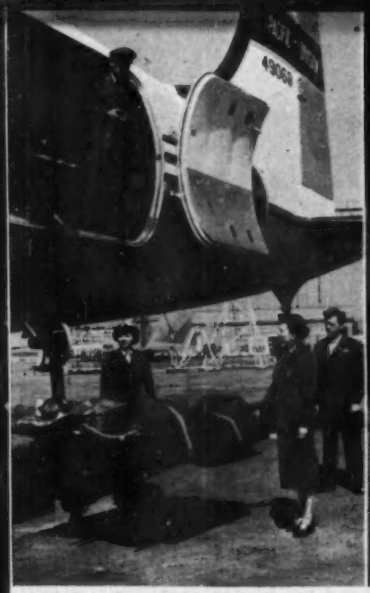


4 Fishing Pole to Cast Lure. If you think that casting for fish is too much work, here is an idea for a fishing rod that would do the job for you. A coiled spring surrounding the flexible rod is pulled back to compress it and then cocked. Pulling a trigger releases the spring, which shoots a lure carrier forward. When the carrier hits the end of the rod, it stops, but the lure and line continue on.

5 Viewer to Ease Map Reading. Clipped onto an ordinary flashlight, this viewer would let a pilot or motorist read maps with one hand. A built-in lens provides magnification for reading small print while the flashlight gives illumination. A U-shaped spring clip would hold the map in place against the bottom of the viewer.

6 Trunks to Fold into Own Pocket. Anyone wearing these bathing trunks wouldn't have to worry about how to carry the wet suit on the trip home from the beach. The trunks are designed to fold right into their own reversible waterproof pocket. When they are being worn, the pocket could be used to hold cigarettes or money.

Patents on these inventions have been granted to: 1. W. Mount, Summit, N. J.; 2. B. Mach, Chicago; 3. A. Lamb, Hillside, N. J.; 4. H. Elliott, Baltimore; 5. O. Quam, Marshalltown, Iowa; 6. F. Kowatsch, Chicago.



Push-button box in hands of sergeant on plane controls lift. Capacity is 500 pounds.

Patients move smoothly and are kept in a perfectly level position as they ride up into plane.

Armlike action of lift places patient inside fuselage where he can be moved easily.

Mechanical Arm Lifts Wounded to Plane

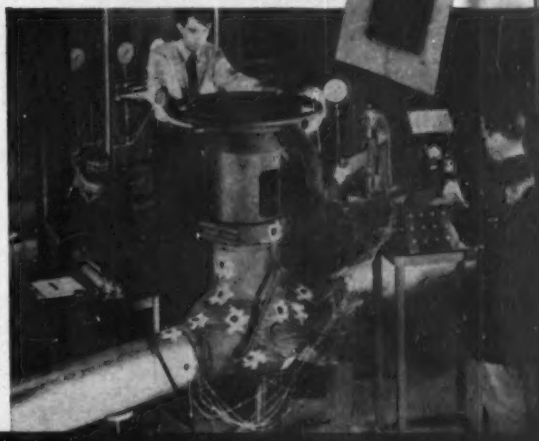
SWEEPING in a single arc like a giant arm, the lift above raises stretcher-borne soldiers safely and swiftly into the Douglas C-54 waiting to take them to rear-area hospitals. Weighing 175 pounds, and easily stowed aboard the plane, the hoists are electrically operated either from the plane itself or from an auxiliary ground supply. They can be adjusted for use on other transports. They were used by the Military Air Transport Service to evacuate wounded troops from Korea.

German Car Can Run in Water

WATER or good solid earth is all the same to the new German Trippel above. Equipped with a six-cylinder engine, it can hit 60 m.p.h. on land or nine m.p.h. when making like a duck. The propeller is lowered by a lever at the driver's seat. The vehicle is similar to amphibians used by German troops in World War II.

Postage-Stamp Gauges Detect Faults

THE patches on the giant water valve below are new "postage-stamp" strain gauges being used to reveal hidden structural weaknesses. Heart of the tiny gauge is very fine copper-nickel wire (right) whose electrical resistance varies at the slightest change in pressure. The unusual gauges can measure dimensional changes in millionths of an inch. Baldwin Locomotive Works, Philadelphia, makes them.



Flash: Army Rations Taste Good Now!

That's the report of a famed explorer —and the result of what we learned about GI field rations in World War II.

AS A veteran explorer, Roy Chapman Andrews has had to feed a lot of men a long way from supermarkets—in the Gobi desert, for example, where the local staple is camel meat. So POPULAR SCIENCE asked him for an expert opinion on the latest Army rations, designed to feed men in remote spots all over the world.

Dr. Andrews looked over the varieties, heaped his plate high with a typical selection, tried it out—and grinned. "This stuff is amazingly good," he said.

"If I were fitting out an expedition today, I'd use as much of these package rations as I could carry and save the bother of planning and buying food in bulk. This Army-ration bacon is pretty salty for desert use, but it tastes better than what we've got in the refrigerator right now."

Which is pretty good evidence that the Quartermaster Corps has succeeded in producing rations not only nourishing, but appetizing. We have learned from World War II, where GIs left a trail of discarded white pellets—dextrose tablets that supplied quick energy but tasted like pills.

We've learned, too, that soldiers in combat are too tense to be really hungry. That's why the assault packet now has only 900 calories—a third of the old K ration.

Rations Tailored to Needs

With our armed forces scattered, today's rations are tailor-made for a variety of operations, climates and emergencies.

Want to feed a field army? There's Field Ration B—the Army's regular food with perishables replaced by canned or dried foods. Want to feed one man? Individual C Ration gives him six days' meals, all different, that he can eat hot or cold. And to assure him a good variety, the labels are left off so he never knows what's coming up next.

A fighter pilot? He only has one hand free, so his special food packet—400 calories in candy, chocolate and gum—is cigarette-pack size and can be opened with a thumb.

Crews and passengers of bombers and transports have their own crash-survival food packets—one for the tropics, another for the Arctic. Shipwrecked sailors get a third packet, designed to keep them alive with a minimum of water.

Special Diets for Wounded

There are packages for the wounded, too. A ration supplement for first-aid stations provides hot drinks to help a man get over shock. Another supplement, for evacuation hospitals, supplies easily digestible foods, so a wounded man can start on a special diet even before he reaches a base hospital.

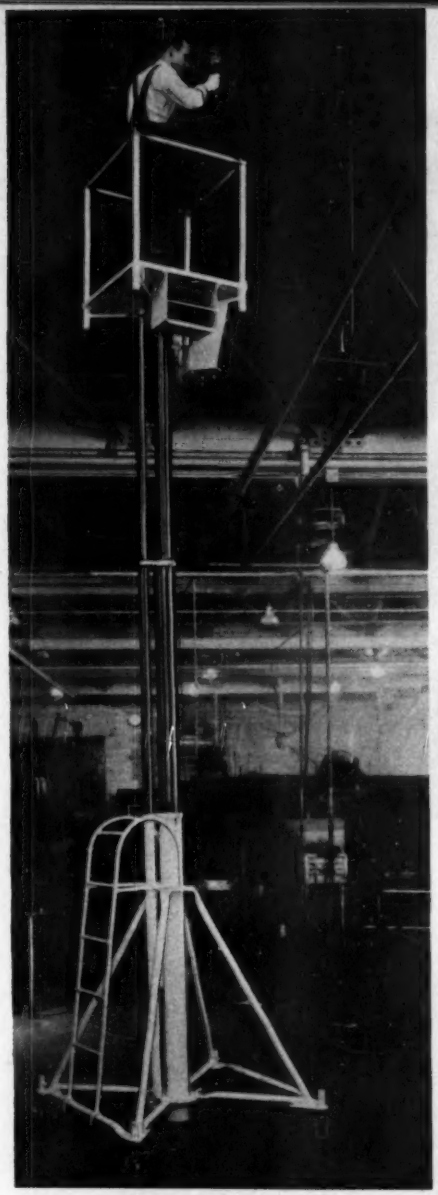
The Quartermaster Corps still has its problems. None of these rations can be stored more than six months without losing some food value. So now research is seeking better packaging methods to allow stockpiling.

Trail Ration, Frigid, used by small patrols in very cold climates, can be eaten cold if necessary. Foil wrapping keeps it waterproof. Each package supplies 4,500 calories—three meals—in meat bars, cereal bars, dehydrated soups, chocolate, hard candy, crackers, beverages.

Roy Chapman Andrews gives his wife a taste of Army's five-in-one ration at his Connecticut farm where he has lived since retiring as Director of New York's Museum of Natural History. His plate is heaped with tomatoes, potatoes, crackers, hash-like beef and vegetables. "This is as good as any hash I've had," he said. "We'll save the rest of the can for supper."

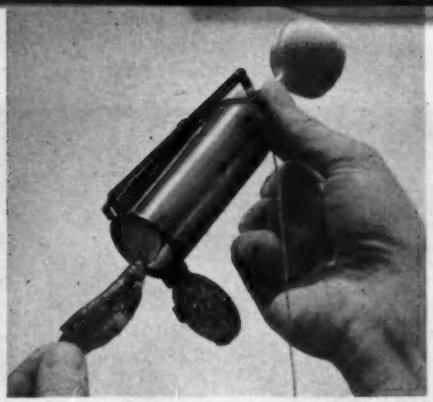
Survival Food Packet, Arctic, is for fliers downed in north. Its 1,700 calories are in high-energy foods such as cereal, fruit, nut bars, plus bag for uneaten portions. "Food packets" are for emergencies: a regular "ration" is all the food one man needs for one day.

Individual Assault Packet takes the place of the K ration for troops in action. It holds one can each of meat and crackers, and a packet of cigarettes, coffee, candy, toilet paper. Eight different meat packs include chicken, hamburgers, beef and corn, ham and eggs. END



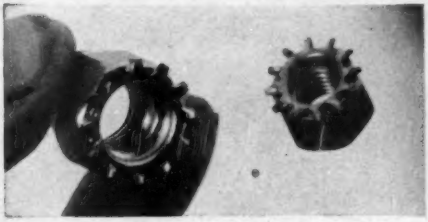
Tower Gives Worker Quick Lift

THE battery-operated hydraulic lift above can boost a worker and his tools into high spots 23 feet above ground in half a minute. Retracted, it is only seven feet high. Each wheel has a safety brake that locks both wheel and swivel. The narrow telescoping tube alongside the main mast insures a gradual drop of the platform even if the hydraulic pump fails. Moto-Lift was developed by Safway Steel Products, Milwaukee.



Container Coddles Live Bait

THIS minnow is protected during casting by a plastic container. When it strikes the water, the bobber rises, opening the trap door and allowing bait and line to sink. Bait-Life is made by the Mackenzie Tool and Engineering Co., Springfield, Mass.



Nuts Have Built-In Lock Washers

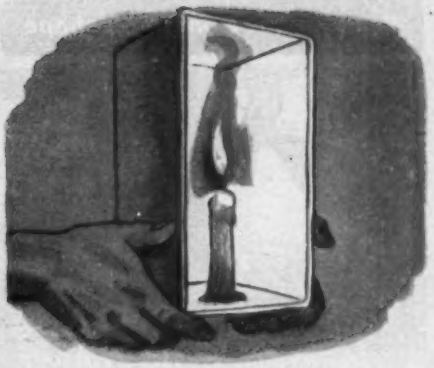
THE toothed washers are built right in the nuts above. They can't fall off, yet rotate freely. KEPS are made by Shakeproof, Inc., Chicago, for mass-assembly operations.

Airport Tower Controls Train

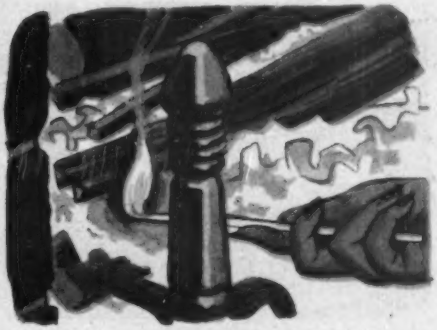
THIS tower controller is gunning a red stop light to a train engineer to give a taxiing airplane the right of way. Reason: the railroad spur for a warehouse terminal runs across the main runway of the Beech Aircraft Corp. airfield at Wichita, Kansas.

Keeping the Home Shipshape

Substitute a piece of clothesline for the drawer pulls and you can open a dresser drawer with one hand. Drawers fixed this way are also more easily opened by small children.

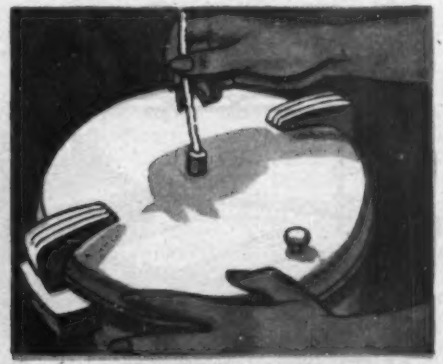


If your electric power goes off, increase your candlepower by using shiny tin pans as reflectors. They'll also keep drafts off the candles when you carry them around.



When burning trash or lighting the fireplace or barbecue fire, use a drinking straw as a torch. Its long length will save matches and prevent scorched fingers.

Dip the threads of a bolt in shellac before screwing on a nut and rust formation will be retarded. Where nuts must be taken off and replaced often, this makes removal easier.

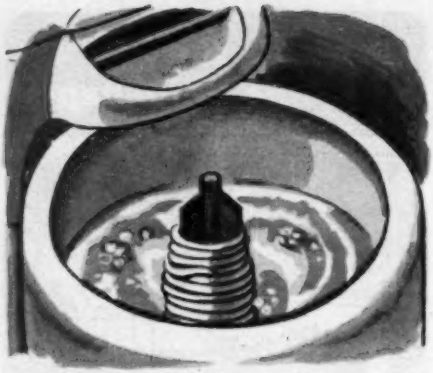


The tiny hole in a pressure-cooker vent sometimes gets clogged with grease. A pipe cleaner does a good cleaning job. Poke it in and out through the hole several times.

Please turn the page for five more suggestions.

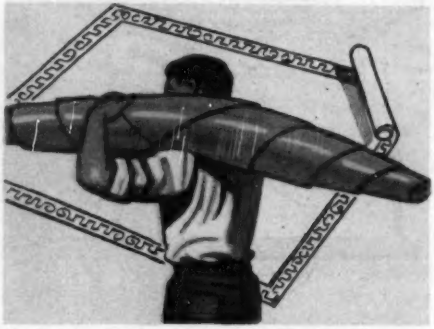
Keeping the Home Shipshape

A wax-paper disk laid on top of leftover paint will seal out air and prevent skin formation. Cut it slightly larger than the can so it will fit snugly inside.

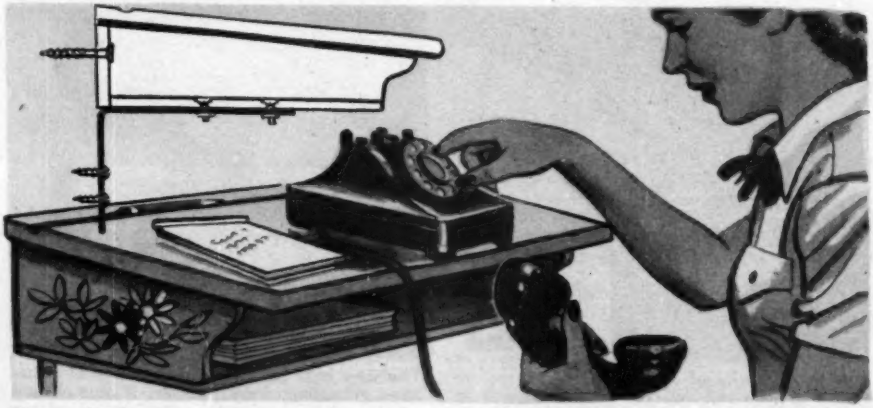


To wash a soiled clothesline, wrap it around the agitator of the washing machine. Tuck the ends in securely so that the line won't get all tangled up.

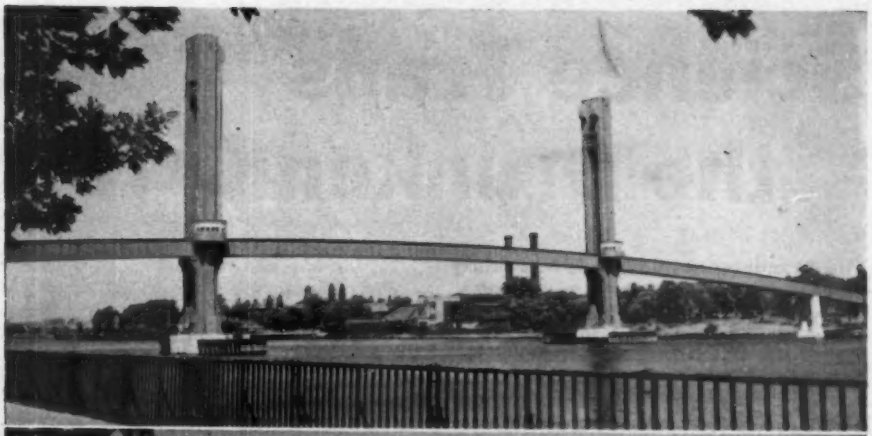
A ring of rubber cut from a truck inner tube and pulled over the bottom of a bucket will keep the pail from sliding on slanting surfaces. It'll also protect polished floors.

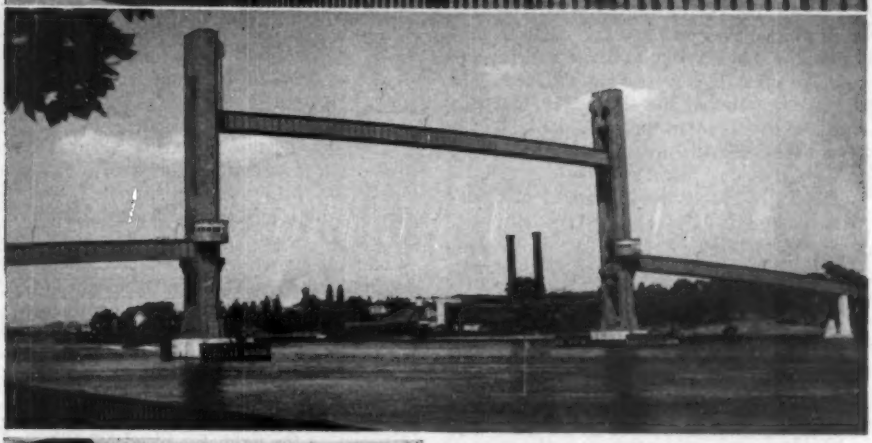


If large rugs are rolled diagonally, they can be carried without buckling and bending. Most of the weight is in the center, making the ends lighter and easier to support.



Many schools are getting new, modern desks. One of the old-fashioned kind makes a useful desk for the kitchen when stripped of legs and hung on the wall.





Control handle raises and lowers span. Center dial in background registers span tilt. Dials on either side show height of each end of span.

Fancy Footbridge Rises 80 Feet

A 956-FOOT, $2,100,000 bridge solely for pedestrians, probably the most costly and elaborate ever built, has been opened in New York City. Its 12-foot-wide walkway spans the Harlem River between Manhattan's East Side and a new 125-acre park on Ward's Island. A 312-foot central section, the world's longest girder-type lift span, rises to 135-foot height to let ships pass.

Operated by one man at an electric console, the 350-ton span is lifted 80 feet by 16 cables in a tower at each end. Automatically regulated motors keep it level to avoid jamming. If self-leveling should fail, a manual control corrects any tilt.

Science Traps the Drunken Driver

The Alcometer not only tells how much alcohol a man has absorbed—it also preserves the evidence for his trial.

By Liam O'Connor

PS PHOTOS BY HUBERT LUCKETT

IT WAS just another drunken-driving case. If you've ever watched one come to trial, you know that's a tough charge for the cops to make stick. This wasn't any different. The defendant, sobered and slicked up, was glib. His lawyer was smart and confident, sharply cross-examining the arresting officer.

Did the defendant's breath smell of whisky? Couldn't tell—was smoking. Could he walk straight? Yes. Did he talk distinctly? Well, reasonably.

The defendant lost his nervousness. His lawyer was right. He'd beat the rap.

And then the police brought out a gray metal box about the size of a suitcase and plugged it in like a radio. The defendant watched with an air of worried recognition as the prosecutor took a tube filled with a blue liquid and inserted it in the box. The needle swung over to the red side of the dial. The prosecutor squinted at it and turned to the judge.

Defendant Changes His Tune

"Your Honor," he said, "I present in evidence this sample of the defendant's breath, which when inserted in this machine shows that the defendant's blood had two-tenths of one percent alcoholic content at the time he was booked. That's well above the legal proof of drunkenness."

The defendant changed his plea to guilty.

That machine—it's called an Alcometer—is going to be playing more and more such dramatic courtroom roles as time goes on. For it holds the answer to the question that a lot of people have been asking: "Why don't the cops do something about drunken drivers?" The cops have been trying—but the rules of evidence are rigid. Now, however, the impersonal testimony of the Alcometer cannot be evaded by a glib defendant and a slick lawyer.

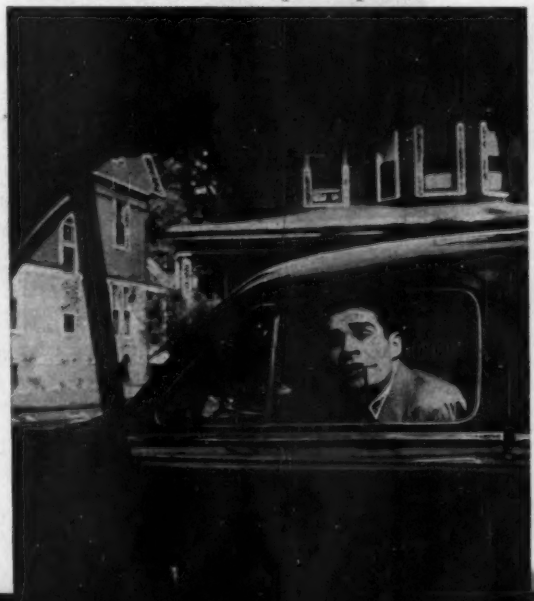
That's why 20 communities are already using the Alcometer to help their police drive the drunken drivers from the roads. Dr. Leon A. Greenberg, associate professor of physiology and assistant director of the Laboratory of Applied Physiology at Yale, spent 11 years perfecting the machine. And if it says a man was drunk he was drunk.

Gives Answer in Five Minutes

The Alcometer reduces the question of intoxication to scientific terms: How much alcohol does this man have in his blood? It answers that question by moving an indicator along a scale.

The policeman who uses the Alcometer doesn't have to make delicate adjustments or know anything about physics or chemistry or laboratory techniques. The officer merely has to get a suspect—like the young man pic-

2 "Kiddie cars belong on the sidewalk, Bud," yells Joe, giving some free advice as he passes on the right. His blood has absorbed more alcohol. Content is now up to .06 percent.



1 **Joe, after a few quick ones,** is having trouble unlocking his car's door. His blood alcohol is already at .05 percent—and he has a bottle in his pocket for the long voyage home.

These pictures of Joe's progress were posed by Jack Milford, a professional actor, with the cooperation of Captain Howard O. Young, Acting Chief, New Haven (Conn.) Police Department.

3 **"That crazy dame!"** mutters Joe, standing on the brake and leaning on the horn as he gives a pedestrian a near miss. A quick nip has sent his blood alcohol up to .09 percent.

4 **"I can do anything,"** boasts Joe as he wriggles out of his coat while driving with one hand. A snort from hidden assets has given him lots of confidence—and .12-percent alcohol.

5 **Somehow, the car is now into a tree.** Joe takes a final slug, then hides the evidence. "No cop's going to frame me"—but the tell-tale blood alcohol has now climbed to .15 percent.

6 **"I only had two beers!"** Joe stands up for his rights. His blood keeps on absorbing alcohol; content now is .17 percent.

7 **"You don't dink I'm thrunk do you?"** Joe believes this is all a big mistake. But his blood alcohol has climbed to .18 percent.

tured here—to blow into a tube, and then start the machine. From that point on the Alcometer runs itself. In five minutes, it has the answer.

Photocell Reads Alcohol Intensity

The air blown into the machine is pumped into a tube containing iodine pentoxide. Alcohol in the breath reacts with the iodine pentoxide and releases free iodine vapor. This vapor passes into a test tube containing a one-percent solution of starch and turns the solution blue. The intensity of the color is then read by a photoelectric cell and reported on a dial in terms of percentage of alcohol in the blood. This is possible because the amount of alcohol in the breath is directly proportional to the amount of alcohol in the blood.

The officer records the reading on a form and removes the tube of blue solution. The latter is sealed and labeled with the driver's name. When the case comes up for trial, the Alcometer is taken into court and plugged into any conventional electric outlet. When the blue test tube is reinserted, the Alcometer reproduces the original reading.

When You're Legally Drunk

According to the National Safety Council and the American Medical Association, a reading of .15 percent can be taken as certain evidence of drunkenness. This is equivalent to 1½ drops of alcohol in every 1,000 drops of blood. A reading of .10 percent is less certain evidence, and .05 percent is not evidence.

It must be remembered that these interpretations are made for the guidance of police departments, public prosecutors, judges and juries. They are true for large numbers of cases, but not necessarily for any individual case. In one scientific investigation, for example, it was found that 11 percent of patients with a blood alcohol of only .05 percent were drunk. Eighty percent of those with blood alcohol levels ranging between .15 percent and .30 percent were drunk. Everyone with a reading of .45 percent or more was drunk.

How Many Drinks Does It Take?

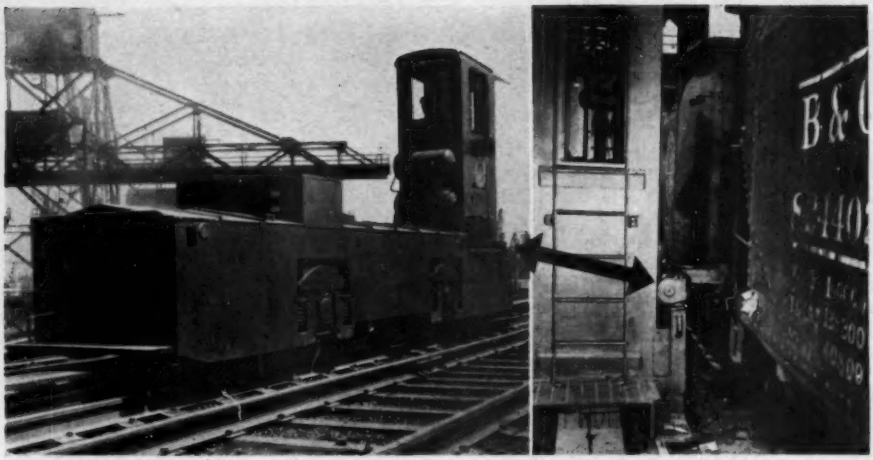
An ounce of whisky will produce a blood-alcohol level of about .03 percent in a 150-pound man in about half an hour. This is the quantity of alcohol contained in one cocktail, or in one highball, or in three ounces of fortified wine (20 percent) or in a 12-ounce bottle of 3.5-percent beer. On this basis, a blood-alcohol level of .15 percent—the drunken driver's passport to jail—will be produced by about five cocktails or five highballs or five bottles of beer or 15 ounces of fortified wine.

The impact of alcohol on the human machine is a progressive one. First to be af-

[*Continued on page 232*]

8 **"Had a hard day, jus' a lil' sleepy,"** Joe explains as he blows into the tube from the funny machine the cop has at the station.

9 **The Alcometer tells the story**—and cooks Joe's goose. The needle swings to .2 percent. Joe is booked as definitely drunk.



Switcher Escorts Cars by the "Arm"

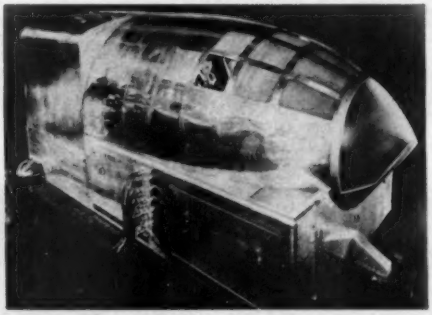
THIS new switch engine comes up alongside a string of boxcars and moves them around a freight yard from the side, instead of pushing from behind. Pincer-shaped arms on both sides of the cab spring out to hook onto the cars (right, above).

Operating on a narrow-gauge track between the standard tracks, the B&O locomotive can hook onto two lines of cars, one on each side, and move them simultaneously, eliminating a lot of shuttling back and forth. A third rail powers the GE-developed switcher's two electric motors.

Flight Trainer Has Real Cockpit

THE inside of this flight trainer for Air Force pilots is an exact duplicate of the cockpit of a B-50-D Superfortress. It is one of a series of flight simulators designed for specific planes rather than for general flight instruction, like the Link.

A pilot, co-pilot and flight engineer can be trained simultaneously in this model. An instructor can feed into the cockpit instruments almost any problem that would be encountered in actual flight. It is in use at Wright-Patterson Air Force Base, Dayton.



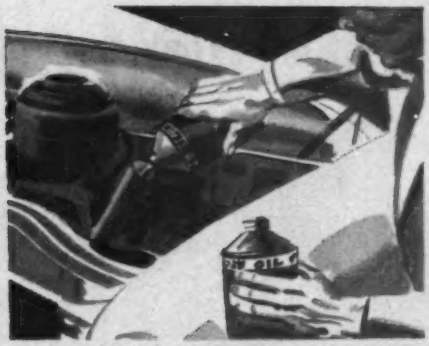
RAF Gets Multijet Heavy Bomber

THE sleek Vickers 660 above is the first in a series of new multijet bombers that will form the backbone of the air force the British are building. Now in quantity production, it will replace piston-engined Lincolns and B-29s as the standard RAF heavy bomber.

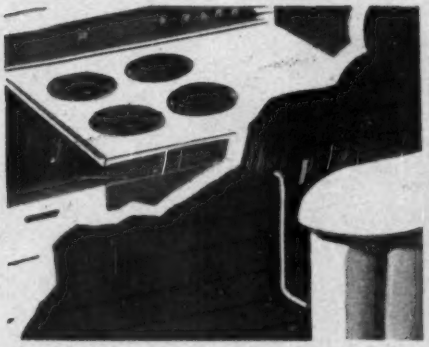
The new 600-m.p.h. plane, which recently made its first flight, is powered by four Rolls-Royce Avon jet engines.

I'd like to see them make...

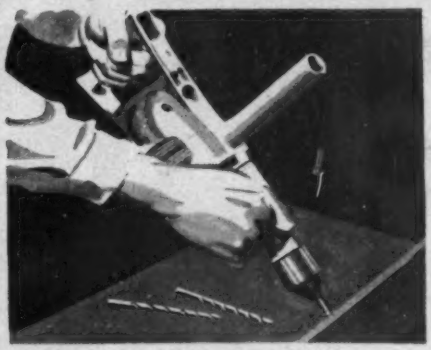
Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? Popular Science will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



Automobile-oil cans shaped like cap-top beer cans. This simple packaging change would eliminate the need for a funnel every time you have to add oil to your car while on the road. *—Rupert Westervelt, Camden, N. J.*

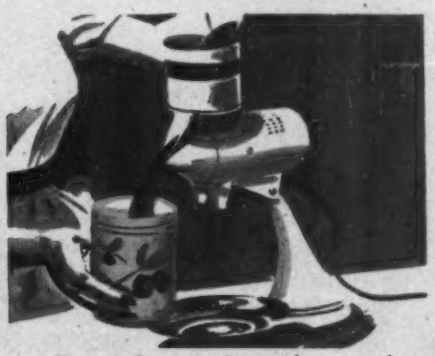


An electric range with some top burners for bottled gas. They'd be invaluable when power fails for long periods. Cylinder outside house would feed gas to burners during emergency. *—Reginald Galbraith, Chicago.*



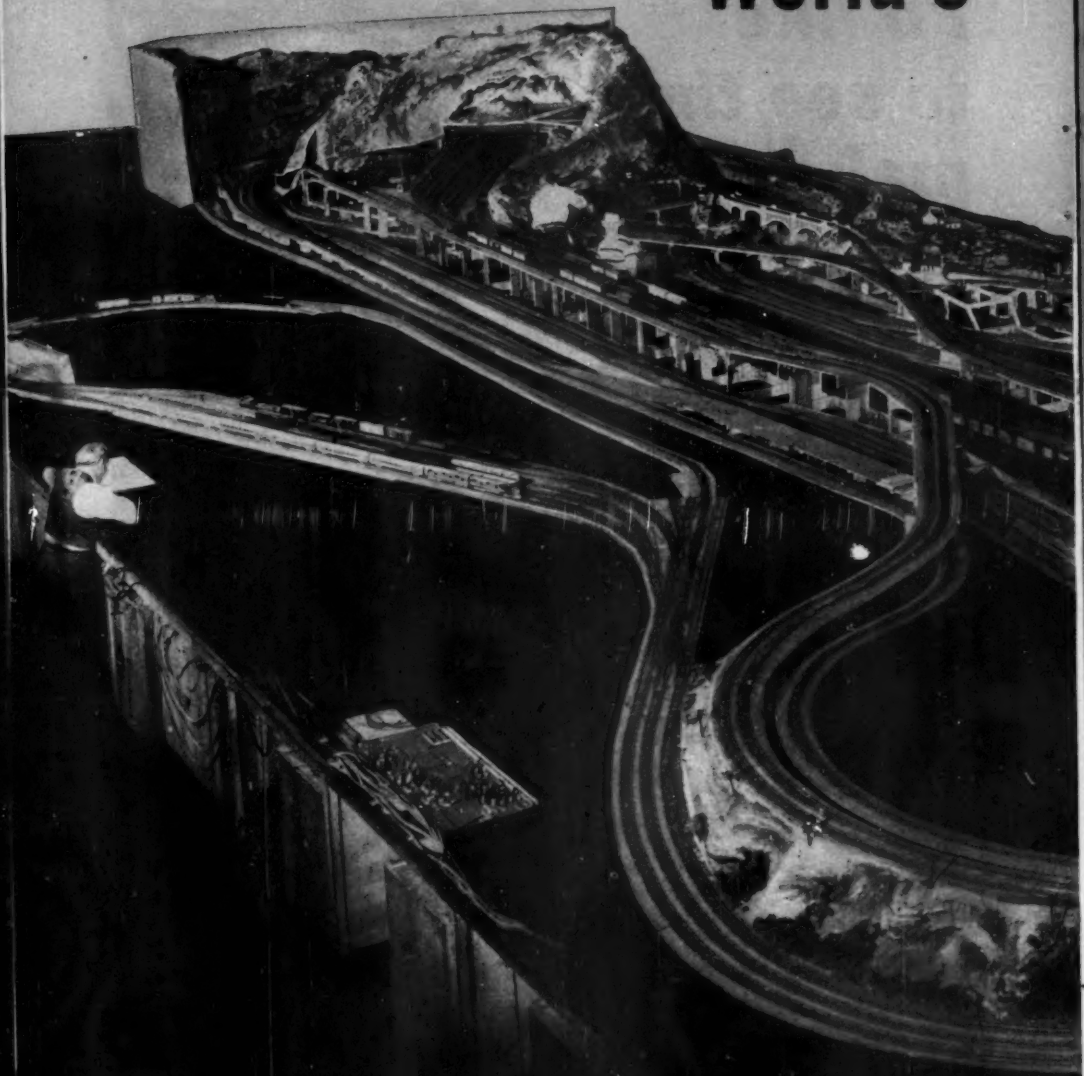
An electric drill with different gear ratios to give right speed for each job the tool is intended to do—grinding, polishing, drilling and so on. Control button near gear end would shift gears.*—David Baker, Rogers, Ark.*

Car-door locks controlled from the driver's door. When driver locks his door on leaving car, all others would lock automatically and could be opened individually from inside only. *—Frank Goldstein, Pittsburgh.*



A coffee-grinding attachment for use with an electric mixer. Probably would have to be adjustable to grind coffee fine, medium or coarse for different methods of brewing.*—Bill Bigelow, Big Pine, Calif.*

How They Are Building The World's



Already boasting more than 4,000 feet of track and still going strong, this model railroader's paradise rivals the big roads in realism of scenery and operation.

Biggest Little Railroad

By Harland Manchester

THE streamlined silver-and-scarlet Super Chief usually streaks between Chicago and Los Angeles; the other day it dashed out of the Lackawanna Terminal at Hoboken, N. J., and headed for the Delaware Water Gap. Speeding along the multiple-track system, we passed an 1870 wood-burning engine, gaudy in red, green and brass brightwork, and a few seconds later waved at a sleek aluminum Buck Rogers-type jet-propelled locomotive, vintage 2,000 A. D.

We zipped through smoke-darkened industrial towns and past green country

PS PHOTOS BY W. W. MORRIS

Model's sprawling tracks cover giant table 95 feet long and 35 feet wide. Multiple-track main lines run on several levels, connecting cities, towns, industrial centers and huge yards. Slot in middle of table gives operators access to layout's center. Mountains looming in background represent Delaware Water Gap. Completed layout will have 7,000 feet of track.

. . . speeding along, we passed an 1870 wood-burning engine

villages, corn fields, filling stations, barns, silos and forests. In this fantastic wonderland of railroadiana we were given a clear track at Black Dan's Cut by the first automatic signal in the United States and a few minutes later were guided through a maze of terminal tracks by the latest electronic route-selecting system.

As the train came to rest after the dizzy whirl through past, present and future, Clark Pool, past president of the New York Society of Model Engineers, reached out like a marionette impresario and picked the locomotive off the tracks.

This trip took place over the Union Connecting Railroad, so-called because it has built-to-scale equipment of every representative American railroad. For 25 years the 100-odd working members of the New York Society—all dyed-in-the-wool model builders—have been accumulating the skills, rolling stock and materials to construct this mammoth model system.

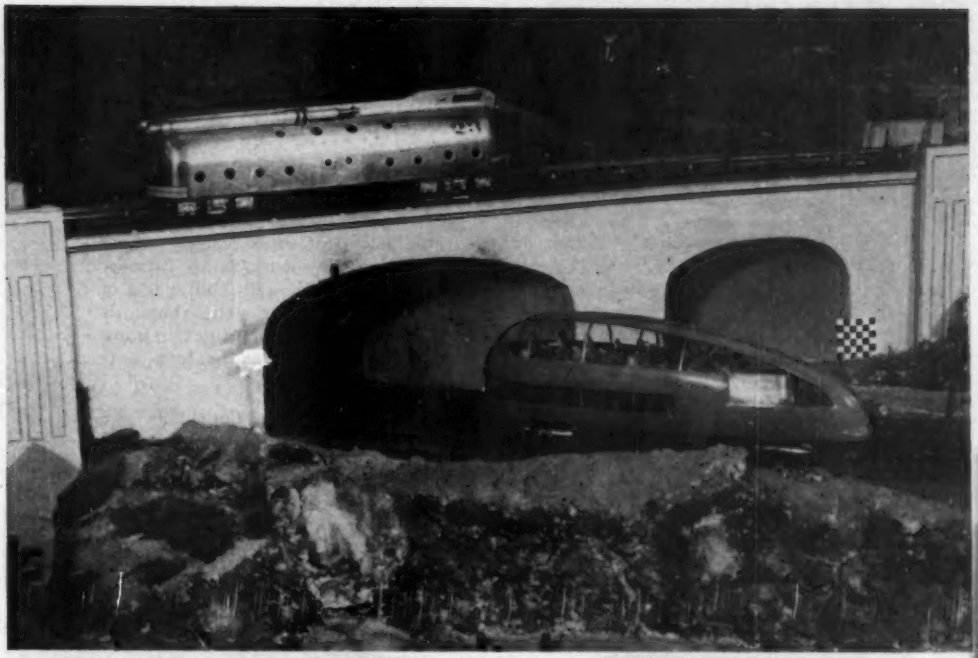
Big but Still Growing

The "UCON RR" has 4,500 feet of track, simulating 40 miles of track in a real railroad. The scale—"O" gauge—is ¼ inch to the foot and the tracks are 1¼ inches between rails. Its rolling stock—most of which is owned by individual members—totals about 200 locomotives and 600 cars of all types. Every sort of railroad accouterment—Pullmans, parlor cars, freight cars, "reefers," "wye" intersections, freight yards, roundhouses, sidings, stations, tunnels and grade crossings—stands complete in the UCON system or is under construction.

Will Have 7,000 Feet of Track

In actual trackage, UCON is out-classed by the East Bay Model Railroad Club of Oakland, Calif., which operates over 5,500 feet, but the New York Society's blueprints call for a system of 7,000 feet and its goal is to run the biggest little railroad in the world.

This model road is appropriately housed in a busy railroad and ferry terminal. It nearly fills a 150-by-60-foot hall in the Hoboken station where Lackawanna passengers change from trains to ferries to cross the Hudson. President White of the Lackawanna made this space available when the New York Society outgrew its Manhattan quarters, and drove a ceremonial golden



. . . then a sleek Buck Rogers-type jet-propelled locomotive

spike to complete the first loop of the New Yorkers' track in New Jersey in September, 1948. The spike was ½ inch long and 1/32 inch square.

Model Includes the Terminal

The first thing a visitor sees when he enters the hall is an amazingly accurate scale replica of the Terminal building itself. Berthold Audsley, architect, professional model builder and one of the society's oldest members, has been working on this replica for three years and expects to finish the job in 18 months.

Before touching a tool, Mr. Audsley obtained the original plans of the building and spent many months meticulously making scale drawings. He is known as the world's leading cardboard-model builder. One of his prize creations, a model facade of a

. . . zipped through smoky industrial towns . . . past barns and silos.

Gothic cathedral with tiny replicas of stained-glass windows bearing images of the saints, may be seen behind glass above his workbench.

Boat Builders Are Indefatigable

His standards were equally high in reproducing the Lackawanna Terminal for the model railroad inside the real Lackawanna Terminal. Squint your eyes and look inside the replica at the counterweighted gangplanks for vehicles, the stairs and the concourse, and you quickly reach that stage of optical illusion where the scene becomes big as life. It has been suggested that he build inside his model station the room housing the model railroad, but he points out that he might feel impelled to go on and build a sub-miniature model station inside that, and no one knows where it would all end.

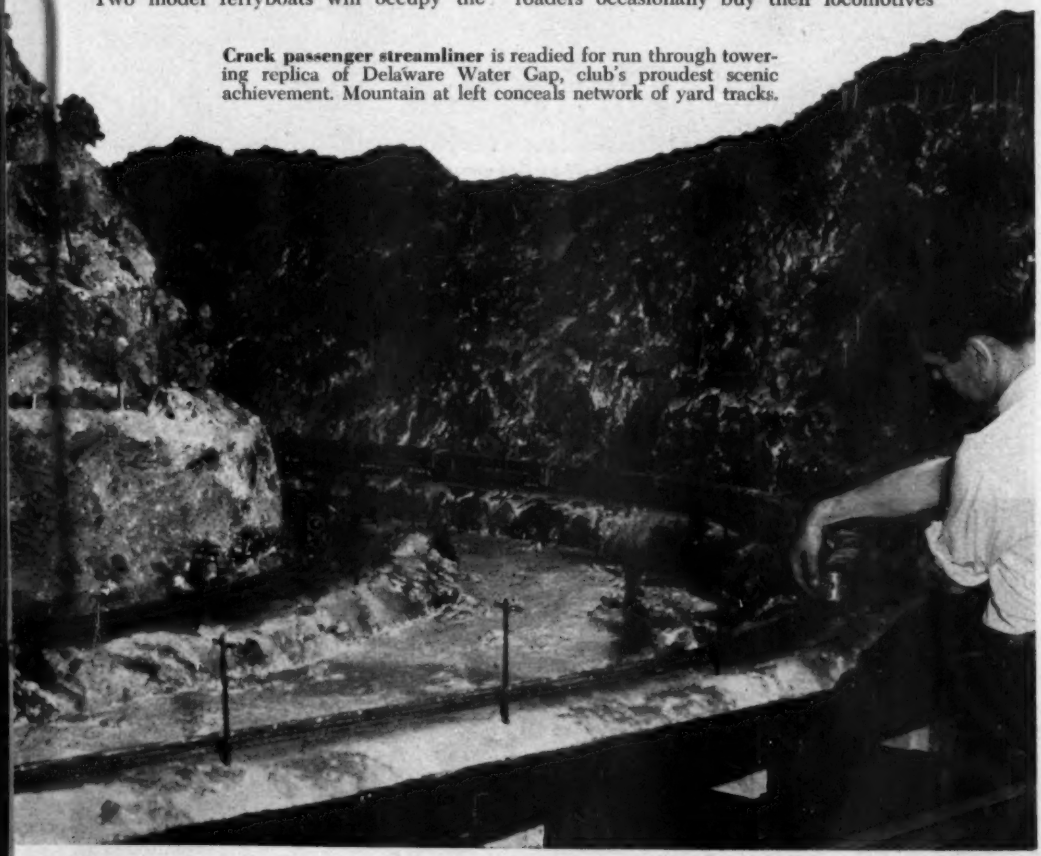
Two model ferryboats will occupy the slips as soon as they are finished. One of them will be a four-foot gem of fidelity called the *Lackawanna*. It has been constructed by George Brunjes, a Brooklyn cabinetmaker and the society's leading woodworker. Peek through the windows and you see rows of realistic benches and delicate stairways with stained dark banisters. Mr. Brunjes has put in all his spare time for two years on this boat.

Near the ferryboat on a balcony where the boat builders now work, is Mr Brunjes' river barge, with deck and hull made of actual miniature planking. His standards are so exacting that even the interior framing of the hull, which can't be seen, was faithfully reproduced.

Famous Locomotives Copied

Building a model locomotive is a demanding and time-consuming job. Model railroaders occasionally buy their locomotives

Crack passenger streamliner is readied for run through towering replica of Delaware Water Gap, club's proudest scenic achievement. Mountain at left conceals network of yard tracks.



complete at prices as high as $500; sometimes they build them from kits. But the real expert scales down the actual plans of a real locomotive and builds it from scratch.

No Detail Overlooked

Joe Dobler has been working since 1929 on a ¾-inch scale model of the Pennsylvania Railroad's M-1 Mountain Train steam locomotive. He obtained the actual plans from the railroad, scaled them down, made wooden patterns, had castings made and machined the castings. Mr. Pool, who is a rate engineer with AT&T, is working on a model of the William Mason, a Baltimore and Ohio wood-burner built in 1856.

Two members, Rex Gifol, liquor-store proprietor, and Sam Ceccino, automobile dealer, own between them about 100 locomotives on which they work either at home or in the society's well equipped machine shop in a room adjoining the UCON RR.

More eyes will pop when Ernest Huebner finishes his model of the Atlantic, built by Phineas Davis in 1832. This famous museum piece has an upright boiler and piston and walking-beam drive. Its "headlight" was a small, metal-surfaced flatcar in front of the engine, on which a wood fire burned. Mr. Huebner is copying this feature, using a red bulb to indicate the fire.

The Steam Is Sometimes Real

Several live-steam locomotives are owned by the members. When these are run on the UCON RR, all tracks must be cleared. The model electric locomotives are stopped by killing the power, but steam engines simply run until the pressure gets low. One model steam engine five feet long—run on a special track—used 10 buckets of water to fill tender and boiler and drank up six more buckets during the afternoon. By law a licensed steam engineer must be present when these locomotives are put through their paces for the public.

Every feature of the UCON RR bespeaks great skill, patience and integrity. John Scharle, a New York subway motorman, told Bruce Coughlin, who is a signal engineer both on the UCON system and the subway, that there ought to be a "wigwag"—a swinging, flashing road signal—before a tunnel entrance near the Delaware Water Gap. Coughlin gave him the green light, and he spent a year duplicating the complicated equipment in a six-inch model.

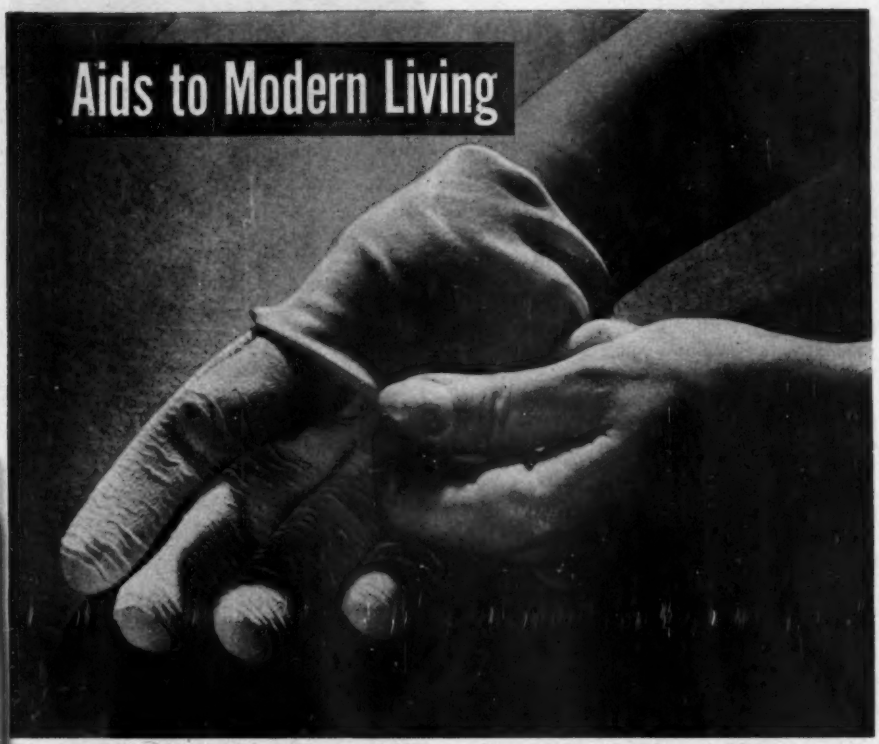
[*Continued on page 234*]

Control panel is one of many, spotted throughout system, that guide trains and throw switches. Operator, wearing telephone headset, keeps in constant touch with other control stations.

Two years of work went into this four-foot model of ferryboat *Lackawanna*, built by Brooklyn cabinetmaker George Brunjes. Boat is one of two that will occupy slips in model terminal.

Maze of wires, some of the hundreds that supply power and operate switches, connects tracks with control station. Connections are made on huge terminal strips to simplify maintenance.

Aids to Modern Living



Gloves Strip Off Easier. The suedelike inner lining in these rubber gloves absorbs perspiration and makes them easier to pull on and off. The crinkled outer finish gives a better grip on soapy dishes. *The Fineline Co., New York City. $1.19.*

Radiation Meter. This pocket-size meter, shaped like an electric razor, warns civil-defense wardens of "hot" areas that should be evacuated. It's powered by two hearing-aid batteries. *Tracerlab, Inc., Boston.*

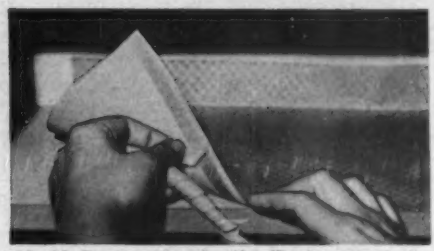
Apron Clips on. A spring-like plastic clip holds this apron around the waist. Remove the belt to launder the apron and there're no strings to tangle in the washer. Irons flat. *Suttle & Rittgers, Inc., Chicago. $2.*

Traveler's Aid. Electric outlets in foreign countries may vary, but these adapters let you plug in a razor or radio anywhere. Resistance cord runs shaver in 220-volt countries. *Bymail Associates, New York City.*

Egg Dispenser. Remove an egg from the front of this refrigerator rack and another rolls into place. Fill at rear to use older eggs first. *Lieber & Son, Royal Oak, Mich.*

Self-Basting Roasts. Now your butcher can wrap a roast so juices stay in and no basting is needed. Machine extrudes cellophane-backed fat for wrapping meat.

Cooking Tool. With this lifter you can handle oven-baked foods without spilling hot juices or burning your hands. Serves as a cooling rack, too. *S-P Corp., St. Paul. $1.*



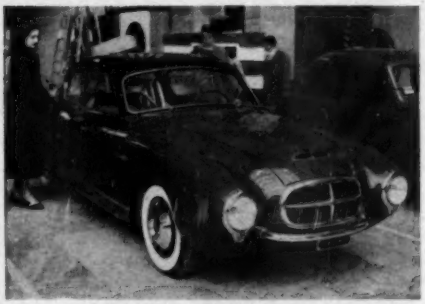
Shelf Paper Needs No Tacks. Peel the protective backing from the adhesive strip, press paper firmly to the shelf, and it's anchored. *Stratocote, Inc., Los Angeles.*

Travel Iron Built In. You won't forget to pack the iron if it's the suitcase handle, too. Works on AC or DC and has automatic heat control. Case is 21 inches long. *Laudner Sales System, Dallas. $28.*

Rolls Off Lint. This roller, wound with adhesive tape sticky side out, picks up lint, hair or powder. Tape can be unwound and torn off to expose a new layer. *Semrow Products Co., Inc., Chicago. $1.50.*

Glass Scrubber. This brush, fastened to sink bottom by suction cups, washes the inside of a glass twirled over the nylon bristles. It washes any size glass. *Wallace, Davis Co., Hamden, Conn. $2.50.*

The Lancia Aurelia Gran Turismo is a two-door coupe for two or three passengers. Its six-cylinder engine puts out 75 hp. Only 55 inches high, it has a wheelbase of 112⅝ inches.



This Riva-styled Fiat 1400 wears one of the 33 different bodies, made by 18 coachmakers, that are available for the Fiat. Costing $2,100 in U.S. money, it has 45-hp. engine.

Italian Cars Are Back—Sporty as Ever

ITALIAN cars are famous the world over for their fine body styling. You can see why by feasting your eyes on these half-dozen new models recently exhibited at the International Auto Show in Turin, Italy.

Only nine makes of cars were on display, but the space was filled with the dozens of different faces put on these same automobiles by 27 custom-body builders.

Good looks aren't all the snappy jobs have to offer. They're small, light and economical to run. Still they're surprisingly powerful—even by U. S. standards.

The number of sleek gas buggies available at the show indicates that the Italian auto industry has come back with a real punch after the complete blackout of the war years. In 1945, only a trickle of cars—10,290—came off the assembly lines. Now production has zoomed to 125,000 a year.

Ferrari's famed racing-car tradition shows up in lines of this Model 2000. Though not itself a racer, the 12-cylinder, 105-hp. job can hit 112 m.p.h. It has a 98⅝-inch wheelbase, sports much-admired wire wheels.

Siata, maker of the Diana above, also builds airplanes. It puts its own special body on a car made from standard Fiat parts. The six-cylinder engine gives 65 hp. at 5,000 r.p.m.

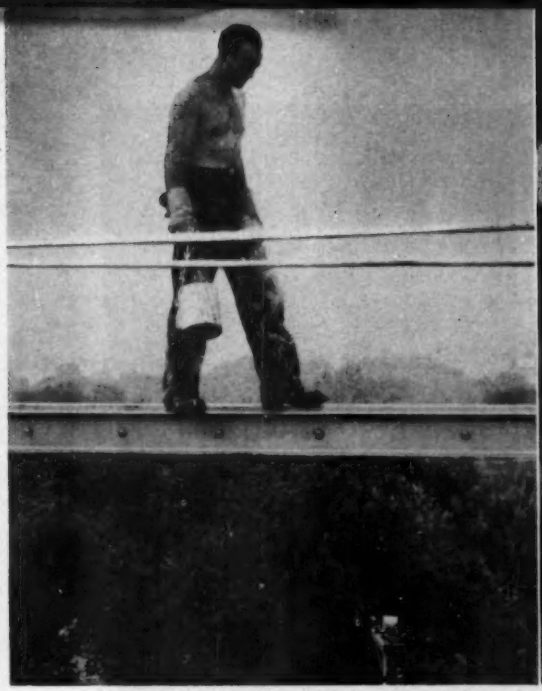
Alfa Romeo Super Sports two-seater is typical example of body styling by coachmaker Pinin Farina. The six-cylinder, 105-hp. engine can speed the 3,050-lb. car to 102 m.p.h.

British car gets the Italian beauty treatment in this eye-catching body on a Bristol 401. Styled by Pinin Farina, the sleek, two-door sportster has a six-cylinder, 85-hp. engine.

An aerial painter pulls himself along in his bosun's chair as he sprays one of tank's girders.

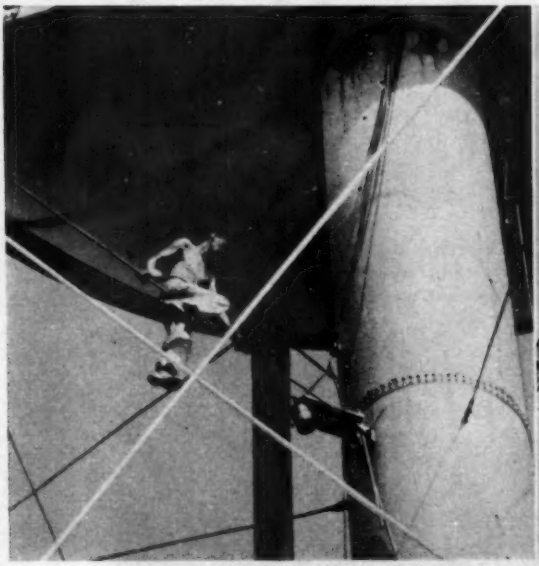
Human Flies with Spray Guns Paint "High Stuff"

MODERN steeplejacks do plenty besides climbing steeples. One of their main jobs is scaling dizzy heights like this towering water tank to paint and make repairs. The spray gun has replaced the paintbrush, but the climbing is the same—on the earthward end of a swaying bosun's chair. Precarious as the job looks, surefootedness and safety devices make accidents rare.

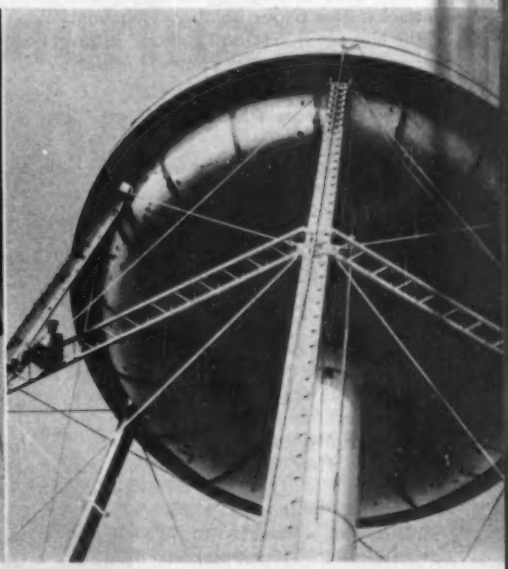


It's a long way down from narrow cross braces, made slippery with paint drippings, but they must be navigated to get from one tie rod to another. Tie rods are painted by rubbing with paint-soaked rag as worker slides along rod.

Painter above the treetops. Secure in his bosun's chair, and holding a spray gun attached to several hundred feet of hose, he starts down the legs of a tank. To get at hard-to-reach spots, he may have to stand up on his chair.



Using a stay rod as a sliding board, this high-stuff painter takes the fast route to his chair after climbing up on a ladder. This way is easier than hauling himself up in the chair.



From sidewalk superintendents' angle, job looks especially risky. But working inside tank can be even more treacherous—painters must be on guard against terrific heat and paint fumes.

Paper Bombs Win Over Enemy

THE sergeant is loading a bomb—with paper. Instead of high explosives, this bomb carries propaganda leaflets and surrender passes. Their effectiveness has been proved in the Korean conflict, where nearly a third of the prisoners taken by UN forces surrendered after undergoing these psychological attacks. The paper bomb, which holds 22,500 sheets, bursts just before hitting the ground, scattering its contents widely.

Timers Keep Tabs on Streetcars

IF A Philadelphia trolley is late, this young lady knows it and can do something about it. The 130 dials around her are GE remotely controlled timers that tell how far any of the city's trolleys or trolley busses is behind the one ahead on the 600-mile system. If the interval gets too long, a bell rings and lights flash. She then uses two-way radio to order a patrol car to investigate the trouble.

Radar Controls Planes Moving on Ground

THE fog gets so thick in London that planes need radar not only to land but also to maneuver on the ground after landing. That's what the big dish antenna mounted on the truck shown at right is for.

The British call it the Aerodrome Surface Movement Indicator. It is now in use guiding aircraft along the many miles of runway at Heathrow Airport after they have landed.

The set, which has a 15-inch screen, is reported to be so sensitive that it can pick up the image of a man while he is crossing the field's traffic lanes.

The "Harmonica King" makes with a little music while he dreams of new worlds to conquer.

Are You Ignoring a $1,000,000 Idea?

Finn Magnus, who found his fortune in plastics, believes every bright young man has similar opportunities.

By L. B. White

THERE'S at least a million dollars lying smack under every ambitious young American's nose. Trouble is, most young men are too busy mooning over those "Retire at 50" ads to notice it.

That is the firm belief of Finn Haakon Magnus, the stocky, 43-year-old founder-president of the Magnus Harmonica Corp., in Newark, N. J. And he can submit personal proof. In his first 18 years in this country, he has turned an immigrant youth's $25 grubstake into a multimillion-dollar business.

This shy, soft-spoken blond Viking athlete out of Norway by way of Denmark did not come up with a sensational new product: people have been making harmonicas for more than 1,000 years. Nor did he develop a miraculous new material: polystyrene plastic has been an industrial commonplace for some time. Magnus simply put the two together, reduced the number of parts in a mouth organ from 68 to five, cut the number of hand operations from 201 to nine and thus produced an instrument that weighs only half as much as the old wood-and-metal type, is 10 times as sanitary, 50 times as durable, and retails for a fifth the price.

With it, he has captured a lion's share of

The boss of a multimillion-dollar corporation still finds time to tinker in his home workshop.

a market that runs to 25,000,000 units a year in America alone (formerly supplied almost entirely from abroad).

He's the Plastic Bagpipe Man

The Magnus Harmonica Corp., still using nothing but plastics, now turns out eight types of garden-variety mouth organ, a horn harmonica, a chromatic shift-bar model, two types of "keymonicas" (half clarinet, half harmonica), a reed flute, a concertina, three sizes of accordions, a four-pound portable electric organ and a toy bagpipe. Just around the corner is a whole line of professional musical instruments. And coming off the drawing boards are plans that call for hundreds of non-musical products.

Simple? Obvious? Finn Magnus specializes in the simple and obvious. He earned his first money, at eight, hopping open-air Copenhagen streetcars to sell papers. At 12, he got all the neighborhood kids to clean and watch bikes at the beach—and give him half of their take for having thought up the idea.

At 16, while competing in the annual Swedish-Norwegian-Danish track meet, he noticed that envious Danes were buying fine camel's-hair sweaters right off the Swedish athletes' backs. So he wrote to the Danish consul-general in Stockholm for the manufacturers' names, signed up as exclusive Danish representative for the biggest of the sweater makers and in one late-summer month earned enough to pay his third-class passage to America.

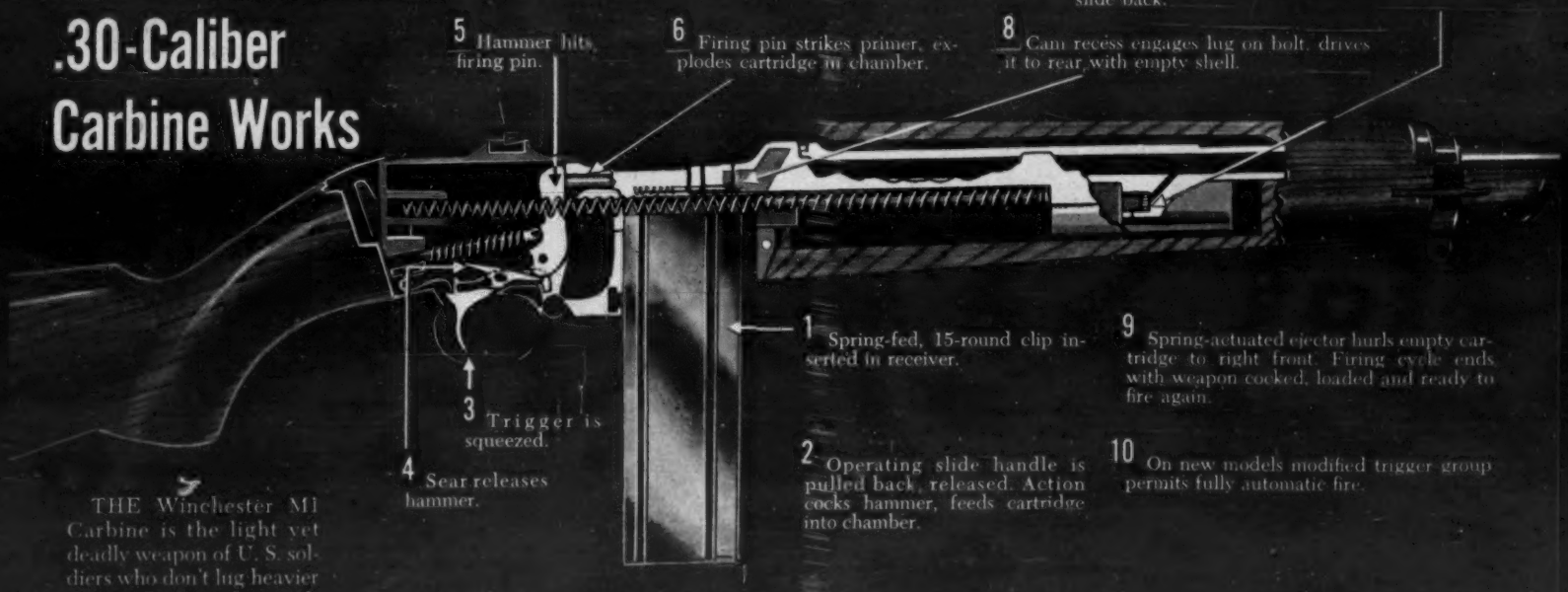
He Learned from Ford

His profound belief (it amounts almost to a religion) that functional simplicity plus

[*Continued on page 240*]

As this assembly wheel revolves, the five parts of the harmonicas drop from hoppers one by one, building up a "sandwich," while glue is squirted in to weld them together.

How the .30-Caliber Carbine Works



THE Winchester M1 Carbine is the light yet deadly weapon of U. S. soldiers who don't lug heavier guns—officers and specialists like radiomen, quartermasters and cooks. It shoots .30-caliber cartridges as fast as the trigger is pulled and is far more accurate at a much greater range than the old .45 pistol it replaces.

FOLDING MODEL FOR PARATROOPS

Know Your Weapons

Maze of hose and wires (far left) had to be disconnected one at a time. Now they are all combined in one quick-disconnect cable (left).

One-piece flying suit (below) will keep USAF airmen warm at temperatures as low as –65° F.

New Flying Suit Is "Electric Blanket"

IT'S cold outside at the high altitudes our military airmen have to fly these days. That's why the Air Force is wrapping its high fliers in the new type of suit shown at right. Built like an electric blanket, it will keep the wearer comfortable at temperatures as low as –65°F.

For fighter pilots, where delay in an ejection-seat bailout can be dangerous, there's a new device (above) that quickly and automatically disconnects him from the maze of hose and wires that tie him in with his high-altitude equipment.

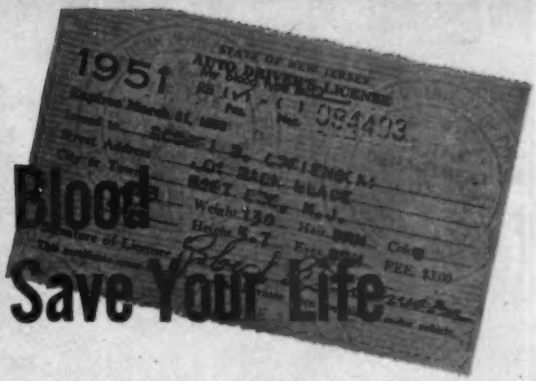
A one-piece coverall, the suit can be worn over standard uniforms and is as warm as a heavy flying suit, even when the electricity isn't turned on. It is used in conjunction with electrically heated gloves and shoes. The heating circuits are arranged so that shoes and gloves can receive normal electric current even if the wattage of the suit proper is reduced.

Moon Too Small to Hold Atmosphere

ONE reason the moon has no atmosphere is that it is so small—less than one-eightieth the mass of the earth. Thus the gravitational attraction is so slight that fast-traveling air molecules easily escape its pull.

Bilge Cleaner Works Automatically

FIRE and explosion hazards are said to be minimized by adding a new liquid to the foul water that collects in the bilge of a boat. The liquid emulsifies all gasoline, oil, and scum, making a solution that is easily pumped overboard. Non-caustic and harmless to paint and fastenings, the chemical, made by the Sudbury Laboratory, South Sudbury, Mass., also is said to remove objectionable bilge odors.



Somebody's Blood May Save Your Life

Flowing in human veins is a strange mixture of chemicals that cheats death on battlefields and in hospitals.

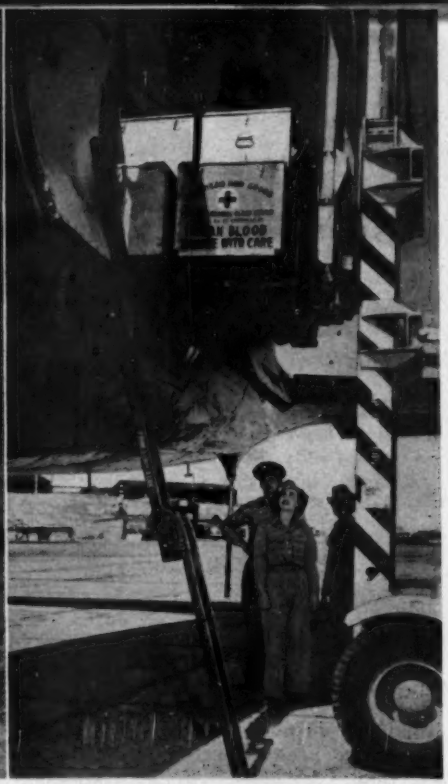
By Martin Mann

WHEN New Jersey residents bought their drivers' licenses this year they found a new space to be filled in. It asked, "Blood Type____." It was there because, in an accident, knowing a man's blood type can save those precious seconds that often save lives.

Do you know *your* blood type? It's a good idea to find out and mark it on your identification papers. If you should be badly hurt and need blood, you couldn't be given any until your blood type were known—transfusing the wrong type would clump yours and probably kill you.

Blood can help protect you against everything from atomic injury to measles. It can save you when you are badly shocked or lose much of your own blood supply. You

Whole blood in wholesale quantities cheated death for injured GIs in Korea. When facilities for storing it were not available in the front lines, blood plasma was used instead.



Giant Air Force transports rush fresh whole blood to areas overseas. Every minute counts, since it deteriorates in 21 days. New techniques may help keep it usable longer.

might need it before, during, and after a serious operation. It can keep you going if you have certain rare diseases, like leukemia—and it is practically the only thing that helps atomic radiation injury.

If you need blood, three times out of four you need whole blood. It can be transfused directly, from a person on a cot next to you, or drawn from a blood bank.

Whole blood from a blood bank has a little added preservative to stop the clotting that normally occurs as soon as blood leaves the body. But even so, it keeps only three weeks. The reason is that the cells in whole blood are not inanimate chemicals, but living things. They are born, live a while, and die. The red cells, probably most important, live an average of 120 days. After three weeks' storage, only 75 percent of the red cells in a bottle of whole blood are still living, and the blood is no longer effective enough to use.

But human blood is literally priceless. Several feverish attempts are now being made to keep it fresh for a longer period.

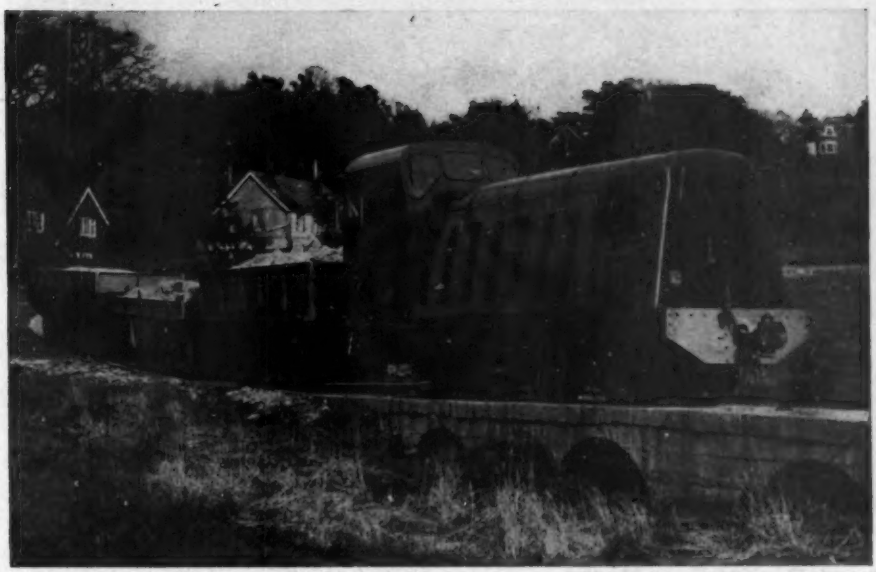
One idea, still experimental, comes from Dr. Max Strumia, of the Bryn Mawr Hospital in Philadelphia. He keeps red cells usable for 60 days by shrinking them with sugar and storing them at low temperature. Other researchers are trying to preserve the white cells, another important part of whole blood. But this is even harder, for there aren't nearly as many white cells and they live only four days.

So far, the time limit for using whole blood is still three weeks. But even after that it is not all wasted. Much of the valuable chemicals can be removed.

Blood is a complicated mixture of many things. About half is living cells—red ones, which carry oxygen around; white ones, which fight disease; and platelets, which help in clotting. The other half is a yellowish liquid, mostly water, called plasma.

Plasma itself is the most useful part of blood. It can frequently be used in place of

[*Continued on page 246*]



Uniline train, pulled by a 90-hp. Diesel, gets its name from the single guide rail.

Rail Steers Truck-Train

THIS train runs on a road and a rail both at the same time, riding like a truck but steering like a railroad train. Truck tires on a concrete roadway carry the weight and furnish the traction. Vertical rollers bearing against the single rail guide the train along the narrow road.

The Uniline system is being used in England to carry heavy, bulky raw materials across rough terrain to regular highways or railways. Its designers, J. Brockhouse & Co., report it is more efficient for such connecting lines than either roads or rails alone: pneumatic tires on concrete can take sharper curves and steeper grades than flanged wheels on rails, while the central guide rail permits using a road that is only as wide as the axles are broad.

Vertical rollers (arrow, above) hanging from car's axle ride along both sides of the center rail to guide the unit like a railroad train. Wide truck tires give good traction on steep grades.

Truck Rears Like a Horse

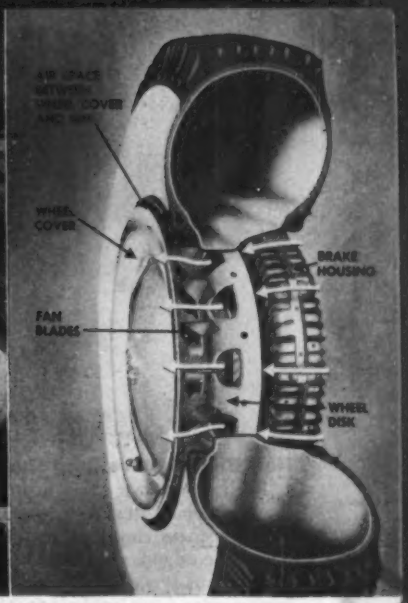
When a heavy load is winched over the tail roller of this British truck (inset), it rears on its hind wheels. With the truck tilted in this way, the winch cable has a straight-line pull on its load. As the load is inched toward the vehicle's center of gravity, the front wheels gradually come down. The truck is being made for use of Shell in Borneo oil fields.

Tower Sits on "Chimney"

Unique among air-traffic control towers in the United States is this 100-foot-high steel structure at Sky Harbor Airport, Phoenix, Ariz. The tower-top operators have to climb 139 steps inside the chimney-like tube, which is nine feet in diameter. The lower platform houses the office of the airport's chief controller.

Rain Raises Convertible Top

The lady in the photo below has just squirted two drops of water on a moisture-sensitive pad between the two seats of Le Sabre, General Motors' laboratory car (PS, Feb. '51, p. 130). Up comes the top automatically. The pad actuates a top-raising electrical circuit to keep the car dry if rain falls while it is parked.



Wheel Fans Cool Brakes

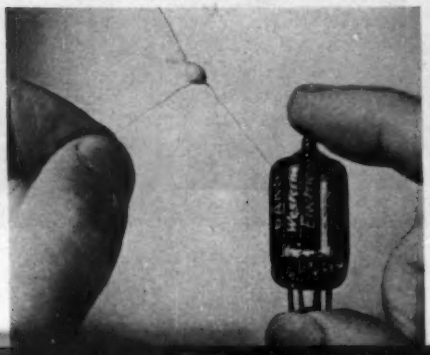
A SET of blades hooked onto a spinning auto wheel serves as a fan to help cool scorching brakes. Developed by Chrysler for its disk brakes, the blades clip to the wheel cover on the outside of the wheel. As the wheel turns, the blades draw fresh, cool air across the finned brake housing on the inside of the wheel, pull it through perforations in the wheel disk, then exhaust it through a gap between the wheel cover and the tire rim.

The new stamped-metal fan assemblies lower internal brake temperatures up to 35 percent. This is said to cut lining wear in half, reduce fading—loss of brake friction due to heat—and stop hydraulic vapor lock, which can render a brake ineffective.

New Amplifier Smaller Than Pea

THIS wire-pierced bead—half the size of a pea—may someday replace the much larger vacuum tube shown with it. It is a new type of transistor, an amplifying device that needs no vacuum, filament or plate, consisting of only a piece of the element germanium and three carefully placed wires. Far smaller and sturdier than a vacuum tube, it uses a million times less power.

This new "junction" transistor, invented by Dr. William Shockley, of Bell Labs, is even smaller and more economical than the original "point-contact" transistor (PS, Sept. '48, p. 117), which is already being put to work in the telephone system.

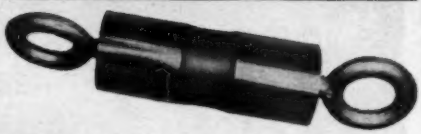


Modern House "Floats" in Air

LACKING sky hooks, the German designers of this futuristic building did the next best thing. They cantilevered the structure out on long arms supported only by three concrete columns. Exhibited at a fair in Hannover, it is said to hold 1,900 persons safely despite its precarious appearance.

New Plane Makes Crop-Dusting Safer

FENCE-HOPPING crop-dusters can fly a plane specially designed to make their daredevil business simpler and safer. The Ag-1 has knife-edged struts on its fixed landing gear to cut fence wires if the pilot gets too low, a wire from cockpit to tail fin to prevent power lines from shearing off the tail if he pulls up too sharply when flying under wires, and a built-in rollover bar. It can fly as slowly as 45 m.p.h. and take off and land on short, rough runways. Spray tanks are in the wings, dust hoppers in the fuselage of the CAA-designed plane.

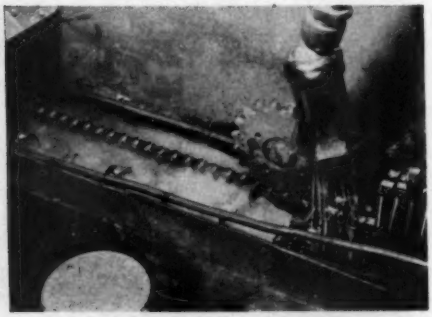


New Chemical Bonds Rubber to Steel

LIFTING 300 pounds of rocks in a tub, the elephant at left shows the strength of a link (close-up view) of silicone rubber bonded to steel. A gluelike liquid that forms the strong bond, discovered by General Electric chemists, promises new applications of the heat-resisting synthetic, such as vibration-absorbing engine mounts.

Sound Waves Clean Shavers

SOUND waves too high-pitched to be heard produce a fog over cleaning solvent, below, in an electric shaver plant in Stamford, Conn. They also force solvent into the tiniest crevices of the shaver heads that pass through it, then emerge under rinse at right. This setup is claimed to be first ultrasonic cleaner on a production line.



Everybody BOUNCES off Everybody Else

That's stock-car racing. Minor bounces don't matter, but a big one at 70 m.p.h. can turn a $3,000 car into a junk heap.

By Gardner Soule

EVERY night this summer, from New England to California, fans have flocked to stock-car races, a sport new in the U. S. since World War II. In Florida, Texas and California, and in some indoor arenas in the North, fans will see more such races this winter. What they are paying to see is traffic jams at 70 miles an hour.

There may be 20 cars in a race, on a track as short as one-fifth of a mile with four turns, and with room for only three cars abreast. On a turn, a driver at the same time may be pushing the car ahead, being pushed by the car behind, and sideswiping the car at his side if not locking wheels with it. All this turns many races into what drivers call billiard-ball affairs—everybody bounces off everybody else.

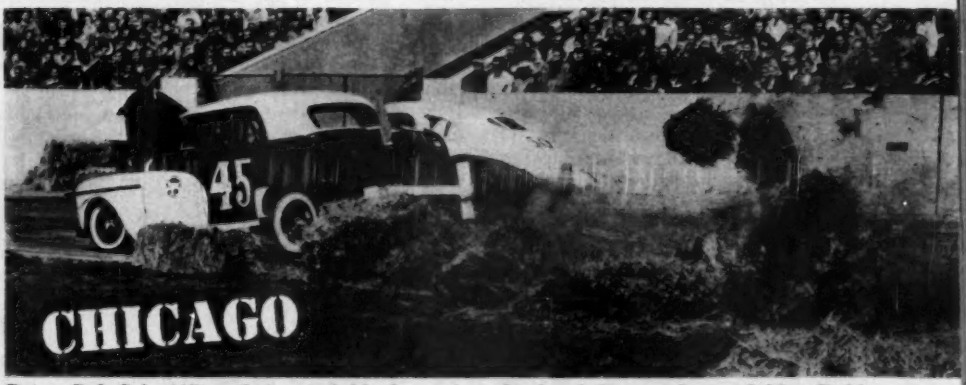
Then there is speed. On any track except the smallest, stock cars make better time than midgets. They average 50 to 60 on small tracks, close to 100 on long tracks,

Trouble on a turn: No. 100, out of control, rolls over. No. 82 spins to avoid crash. No. 52, meanwhile, rushes past, gains in race.

Flips, Spins—and Heaven Knows What

A FLIP is a turnover. A spin is a skid. Flips and spins happen in almost every race and even when stock cars are warming up on the track before a race. They are only two of hundreds of things that can happen—and no man knows what will happen next. Here are five trouble photographs made all over the U. S. in this summer's racing. They show why the tow-truck driver is the busiest man at a stock-car track. For total injuries in accidents shown here, see caption with last photo on the facing page.

Two cars flip at one time on Indiana track.



Driver Bob Cole (45) sails into infield, churns hay; his hood flies up. Scene: Soldier Field.

and hit 108 or 109 on long straightaways.

There is democracy. A champion driver must race against all comers. Any qualified man or woman can enter. A few girls do.

There is skill. It takes brains, a sharp eye and an educated toe—all coordinated—to get through an opening and pass another car. There are characters. "This driver," the announcer may say, "always looks backward. He is interested in where he's been, not where he's going."

Races are run for modified Fords, for jalopies (non-modified Fords), for non-Fords (any other make), and for late models.

Modified means the engine has been souped up. Things happen to the body and chassis of any car before it enters a race. All excess weight—extra seats, horn, emergency brake and so forth—is removed. Headlights are removed. Racing tires are put on, either on all four wheels or on rear wheels only. These are "baldy" tires—their treads perfectly smooth—made that way by recapping ordinary tires at $25 each.

Differential action in rear wheels is eliminated. This is done to gain power and to prevent either rear wheel from spinning. It is accomplished by adding a patented spool, by welding together the spiders in the differential or by other methods. Stock cars race in second gear and there's no time to shift. A gimmick locks the car in gear.

Accidents Are Anticipated

Safety precautions are enforced. All glass is taken off except the windshield. A bucket seat for the driver is bolted directly to the frame. Rollover bars are installed. Big crash bars of wood or metal replace regular bumpers. The door away from the driver

Photo by Bill Aitken

Third car spins completely around, while fourth car (far right) heads into capsized No. 31.

Photo by Jack Cansler

Driver Bill Myers (6) loses front wheel, which trails (right). Race is on North Carolina track.

Photo by Frank Smith

In one of commonest accidents, driver Ray Contarion flies over rail at New Jersey track. He will land in the brush. Race will not be slowed up because he will be no hazard on track.

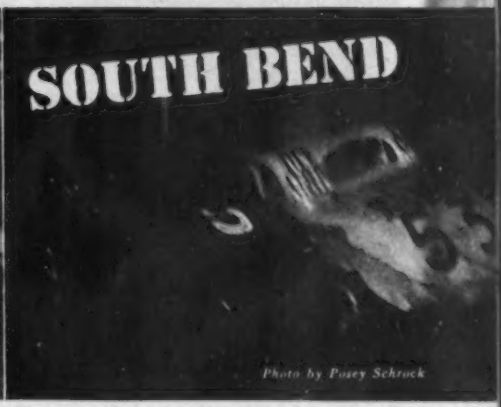


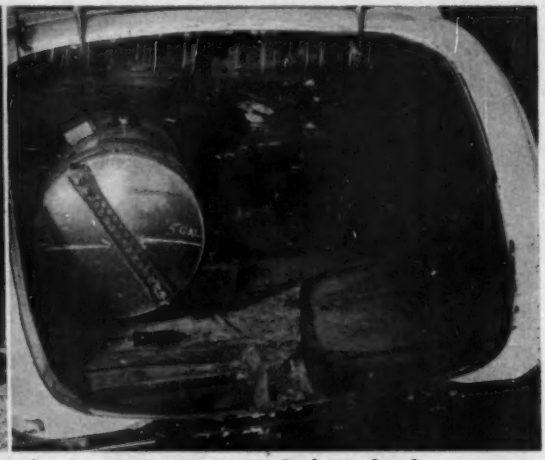
Photo by Posey Schrock

Two dive for same opening, hit rail instead. There are almost no serious injuries in stock-car racing. Total injuries in accidents shown on these two pages: None whatever.

Champion driver in New York area is Johnny Zeke, 30, a believer in safety belt (under elbow) and caution. Pump near seat builds up air pressure in gas tank to aid starting.

Rollover bars (steel framework behind Zeke) hold up roof in turnover. Helmet is plastic, lined with foam rubber. Zeke thinks bars, belt, helmet should be used by highway drivers.

The tire for his left rear wheel (foreground) is smaller than tire for right wheel (behind it). Differential action is eliminated, and right (outside) wheel travels longer distance.



Gasoline tank is in trunk. In front of tank is a metal firewall to protect driver. Zeke mixes his own gas, uses lots of Ethyl. He gets four to five miles a gallon.

is welded, bolted or lashed tightly shut. The door next to him isn't. He may have to get out fast.

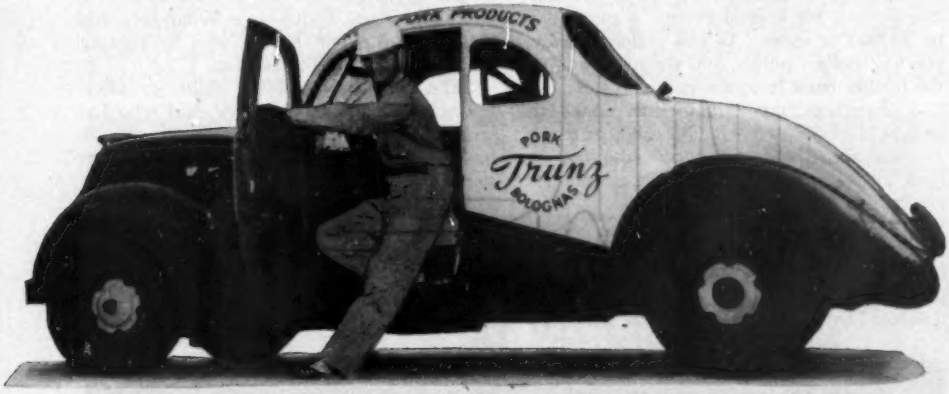
The simplest way to soup up a car probably would be to get a blueprint of a winning car. But you can't. The blueprints don't exist. This is because drivers and mechanics constantly tinker with their racers, and the cars continually cannibalize (eat up parts from one another), so that a car at any time is a conglomeration of changes.

The boys do everything they can think of. They increase carburetion by adding carburetors till they have three or four. They put in racing heads, cams, cranks, pistons, larger valves. They rebuild back ends.

Modifications must be made with an eye to specifications laid down by the association in whose races a car will compete. The All State Racing Stock Car Club, Inc., of

His dashboard has two temperature gauges (extreme left and right)—one for each bank of cylinders in his modified Ford V-8. The two gauges help him locate heating trouble quickly.

Zeke uses three carburetors. He and his mechanics cannot even remember everything they have done to engine. He uses two direct exhausts, says he gains 10 hp. from this alone.

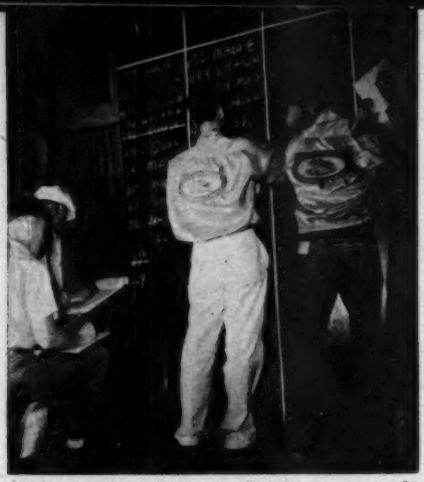


Zeke's car, a 1937 model, was once city Department of Sanitation inspection car. Fenders are shaved back. Rear wheels, on truck spindles, are set out. Zeke drives in those sandals.

New York, has specifications that permit reinforcement of any part; any flywheel; any type battery ignition; magnetos; any model flat-type cylinder heads; any valve springs; any type carburetors; altered camshafts; and altered crankshafts. Any block can be oversize. Piston displacement is limited by the specifications, in cars having L-head engines, to 300 cubic inches except where the engine is used in the same body and chassis it was designed for. Under 300 cubic inches, engines may be interchanged in the same manufacturer's line.

A car suitable for racing may be bought from a friend, a used-car dealer or a specialist in wrecks. The chassis must be straight. That's the main thing. After the car is bought, for $350 up, the souping-up can cost $1,200 to $2,000 more, and if the rear end is rebuilt, $350 or more can go into it. A man who has completed modifying his car will have turned an 85-hp. Ford V-8 into a 250-hp. buggy. Then he can start trying to win back some of that money.

What a man collects for a night's driving depends on the size of the crowd and where he places. A feather foot driving a heap (a slow car) may get only $2 for finishing way



All State racing director, Gus Hager (seated) approves entries, collects $2 entrance fees, directs posting on blackboard of positions in which drivers must line up for each race.

back in a heat; a lead foot may get $141 for winning the evening's semifinal, or $188 for winning the main event. These are routine purses; for special events, a purse can be $1,000 or more. As you collect money, you also collect points, and the more points, the farther back from the pole you start.

A champion may start, for instance, 18th in a field of 20. To win, he must pass the 17 cars ahead and not permit the two in back to pass him.

Three Minutes to Get in Front

If the race is 10 laps, as a heat (a qualifying race) often is, he has about three minutes of hairpin driving to accomplish his mission. In a semifinal, he may have 12 laps to pass cars ahead; in a main, 20, 25 or sometimes even 100 or more laps.

How hard everybody tries to win is indicated by an item in a recent issue of Walter Bull's *Illustrated Speedway News,* telling about Nelson Applegate, 1950 champion at Morristown, N. J.:

"Nelson's car lost its left front wheel on the 21st lap but he continued on and even passed several cars, but the thrilling ride ended when the right front wheel separated itself from the car."

The current New York City area champion is Johnny Zeke, an ex-GI of Levittown. Zeke switched from midgets in 1949 when stock cars started drawing the crowds.

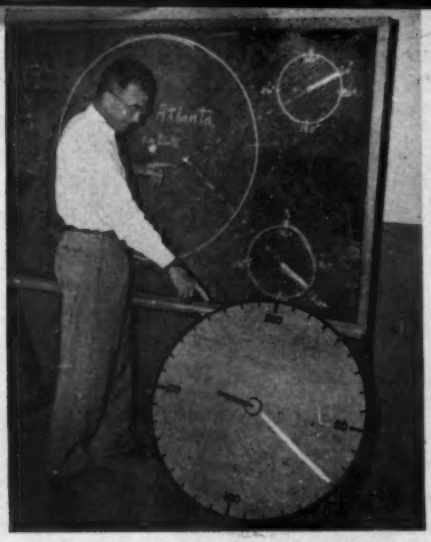
Always Knows His Position

Zeke knows his exact position almost anytime during a race. If he doesn't, he learns when he reaches the No. 2 spot because the front runner will weave in and out and try to keep him from passing. He likes the longer races because he has more time to catch and pass. Twice—in a 50-lap race and in a 100-lap event—he has won by passing on the last turn of the last lap.

Zeke, who drives seven nights or afternoons a week in the summer, and who has left his car a total wreck against the wall, has never been scratched. This he credits to his safety belt, crash helmet, rollover bars, and to the drivers' frame of mind. It was summarized thus by one of them:

"You're safer on the track than on the road. I get out on the road and I'm scared. On the track, everybody's thinking about everybody."

Starter Myke Collins here waves green flag to start a race as he dances at the edge of track. Throughout race he directs drivers by holding flags or pointing almost under their noses.



Dials to Show Where A-Bomb Hits

"SUNDIALS" on the outskirts of Atlanta, Ga., will enable civil-defense workers to locate the center of an A-bomb blast within minutes. A 36-inch wooden disk will be charred except where an upright rod casts a "shadow" (represented by white line in photo). Lines of sight along unburned marks on two dials converge at blast's center.

Jokester's Hint Improves Planes

NAVAL Air Transport men on Hawaii saw a good idea in a jest. When an Air Force captain remarked that their "plush" Skymaster planes had everything but white-sidewall tires, they remedied the lack with white paint. Now the wheels stand out on a dark night, and a control tower can check whether they're properly down for landing.

Tower Built, Torn Down for Shipment

AS SOON as the workmen finish assembling this giant radar tower, they'll turn right around and knock it all apart. Then they'll pack it up with the tools needed to put it back together again and ship it off to the Air Force. That's the way Goodyear makes sure the pieces are all there and fit together properly.

"Periscope" Camera Aids Doctors

THIS new medical camera can peer right into the dark corners of the eye, ear, nose, mouth or throat. A 35-mm. single-lens reflex, it has a built-in flashbulb and an angled mirror on the end of an arm to get around obstructions. The camera was devised by Air Force Capt. Harry R. White, shown using it to photograph his own teeth.

This table-top garden is silver and bronze. The "plants" were cast in the pattern of live ones by Simon Yavitz. Here he cuts down a silver cactus to make it fit with other replicas.

Metal "Plants" Cast from Life

YOU couldn't tell by looks alone, but the "cactus" at right in the picture above is solid metal. The plant at left is real.

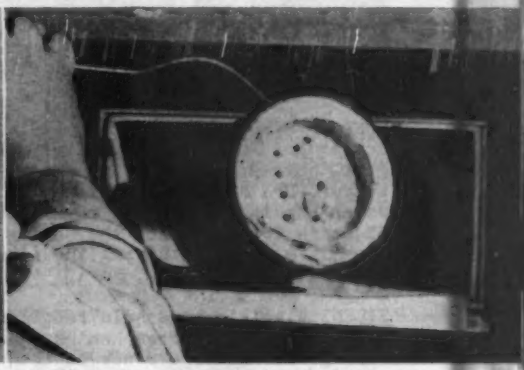
Making such eye-tricking replicas is the hobby of Simon Yavitz, retired New York banker. He achieves his realistic results in an unusual way—a live plant serves as the actual pattern to form the mold in which the metal replica is cast.

It's a variation of the famous lost-wax method, employed by Benvenuto Cellini centuries ago and used today for much precision casting. Mr. Yavitz surrounds a live plant with plaster. After the plaster hardens, the plant is burned away, leaving every tiny detail of its shape cut into the plaster. Metal can then be cast in this plaster mold.

1 To make his real-life molds, Mr. Yavitz mounts a living plant in wax, and then seals a metal cylinder to the mounting. The plant will serve as a pattern to make the mold cavity.

2 The plaster is poured around the plant slowly to prevent bubbles. Called an "investment," it is a muddy mixture of refractory particles with a binder to make it set quickly.

3 The cylinder, now containing the plant embedded in plaster, is placed under a glass jar. The air is then pumped out to remove any bubbles, which might mar the final casting.



4 When plaster is hard, the cylinder is put into an electric furnace having a temperature of 1,300°. Heat burns away the plant, which vaporizes through the small holes in the plaster.

5 The burned-out cylinder is then placed on a centrifugal-casting machine. Here molten silver is slung into every tiny crevice of the mold, insuring finely detailed casting.

6 And here is the silver "plant." Mr. Yavitz carefully picks away bits of plaster stuck to leaves after mold was broken. Some of his work is used for museum exhibits. END

P.S. Last minute news & notes...

RADIAL DIESEL engines, something new in the Navy, will drive our new attack submarines. Taking up only two-thirds as much room as the older types, the radial engine weighs half as much--and savings in space and weight are as vital in submarines as in aircraft. The 16-cylinder Diesel has rings of cylinders stacked like pancakes on a vertical crankshaft.

MAKING CORTISONE from wild roots on an industrial scale will begin in Mexico early next year. This follows recent discovery of a way to synthesize the $650-an-ounce anti-arthritic hormone from plentiful, inedible tropical yams. Heretofore the rare wonder drug has been obtainable only from scarce and expensive cattle bile.

EIGHT HOURS after taking off at Elmira, N. Y., pilot Dick Johnson landed his 55-foot-wingspread glider at Norfolk, Va., and claimed a new soaring record of 360 miles. Previous record: a 325-mile flight in 1947.

HUNTING FIREFLIES has given small fry of Baltimore, Md., a lively and profitable summer's sport. Each summer, Dr. William D. McElroy of Johns Hopkins University pays them 25 cents for every 100 they bring him alive. He's studying the firefly's light.

SILENT electric household refrigerators, making cold from heat as gas refrigerators do, are now on the market. Made in eight sizes by Servel, Inc., they have no moving parts to wear out or need repair. Only difference from popular gas models: an electric heating element instead of a gas burner.

WOULD YOU shine in an engineering job? You stand a better chance if you're good at solving geometry problems, declares Dr. E. F. W. Alexanderson, General Electric radio and television pioneer. Algebra's routine stuff, he holds--but geometry really takes imagination.

A NEW JAGUAR sports car, the XK 120C, is on the way. Very light, and using the same engine as the familiar XK 120 (see p. 84), the XK 120C weighs only 11 pounds per horsepower. The frame is tubular instead of box-section, wheelbase is six inches shorter, and torsion-bar suspension replaces semi-elliptic springs in the rear.

ANY TALK about Russian planes crudely copied from British, German or American aircraft is so much eyewash--on the testimony of U. S. evaluation teams. Workmanship on a crashed and captured MiG-15 proved to be superlatively good. Of the engine, Gen. Hoyt S. Vandenberg, Chief of the U.S. Air Staff, had this to say: "The indication is that they have a jet engine in the MiG-15 that is superior to any jet engine that we have today."

IF YOU'VE MADE an especially "unique, interesting, decorative or useful item" from a glass bottle or jar, it may win you a prize of as much as $500 from the Glass Bottle Blowers Association. Send a description, preferably with a snapshot or drawing, to Glass Hobby Contest, 1133 Broadway, New York 10, N.Y. Contest closes October 15.

LOOK FOR important developments ahead in harnessing the rays of atom smashers and radioactive materials to produce useful chemical reactions. One current General Electric project: making solid plastics from liquid raw materials by bombarding them with high-voltage electrons.

A HONEY OF A HOBBY is what PS Mechanics & Handicraft Editor Harry Walton calls craftwork with acrylic plastics in his new book, Plastics for the Home Craftsman. It's just been published by McGraw-Hill.

RADIATOR TANKS in some of the latest '51 cars are made of steel instead of brass because of material restrictions. Be sure to dose them with rust inhibitor.

The Editors

MECHANICS
and
HANDICRAFT
REG. U. S. PAT. OFF.

TV Color 'Sampler' Costs Only $8

Until I'd seen TV color, I didn't know how good it can be. This simple rig—using only scrap-box parts—brings color to a TV set.

By Herbert Pfister

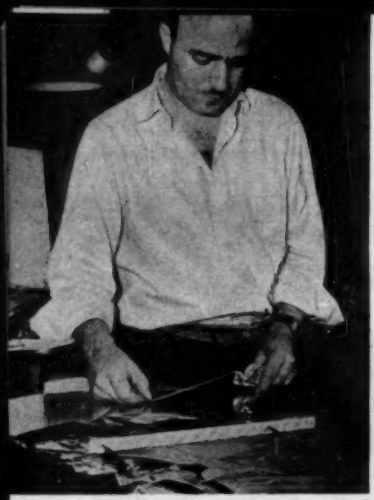
WE'RE already enjoying the color shows at my house, and I've only spent $8 for these previews of the future.

I'll want a better color TV set some day, but this rig has the great merit of simplicity. It's strictly mechanical, because I'm in the kindergarten when it comes to electronics.

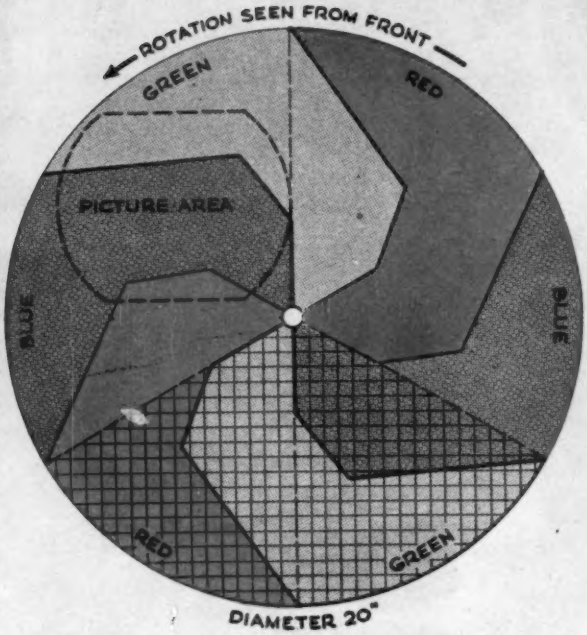
So POPULAR SCIENCE's editors asked me to tell you how to build one like it.

Your wife will probably object to having the setup in your living room permanently, but she'll be as delighted as you are with the color pictures.

The synchronism isn't automatic—



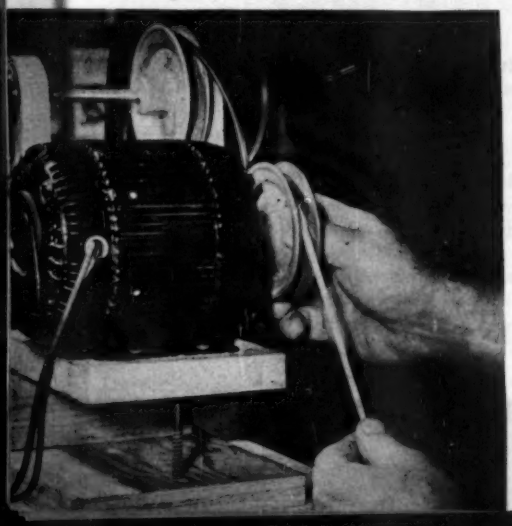
Making the wheel. I started with a 21" square of Lucite 1/16" thick. After sawing it to a rough circle, I centered it on the threaded shaft, clamping it between washers and nuts. Then I cut it to a true circle by holding a chisel to the edge while it ran. Cut-outs of colored cellophane, taped to the plastic, completed the wheel.



you hold a flexible-cable speed control, touching it whenever the picture is about to drift out of "sync." This isn't hard; with the wheel speed set right initially, it will stay on the nose for many seconds, and a touch of the hand control brings it back.

Building an automatically synchronized wheel is tougher. That calls for a tone generator, a fistful of tubes, a saturable reactor and some special circuitry.

Adjusting speed. You can bring the ratio between motor pulley and shaft pulley to just about the right speed by padding the pulleys with strips of masking tape. Building up the motor pulley turns the wheel faster. Adding to the shaft pulley slows down the wheel.



What you need. First off, your receiver must be color-adapted—modified so you can switch to the special scanning rates used in color broadcasts (see PS, Dec. '50, p. 121 and July '51, p. 97). You'll also need a constant-speed motor, a homemade or commercial color wheel, and some pulleys, shafting, belts and scrap-box findings.

Wheel. Factory-made 20" color wheels (suitable for use with a 10" receiver) are currently available for about $18. I made my own, taping colored cellophane to a 1/16" clear-plastic disk. The drawing shows the hook shape and color sequence required for present transmitting standards. I laid out a cardboard cutting pattern to help me trim uniform, properly shaped color segments. If you have trouble finding cellophane sheets of the right hue and saturation, theatrical floodlight filters or photographic filters are okay. Or you can buy filters made expressly for color TV by Eastman Kodak.

Motor. Profit by my experience and steer clear of AC-DC motors—brush sparking will make your picture go blooey. Use a split-phase or repulsion-induction motor, preferably 1/10-hp. or better because the belt, pulleys and big disk soak up plenty of

power. A ¼-h.p., 1,750-r.p.m. shop motor will do, though it's a bit big.

Mounting. This will depend on your TV set. With the color sequence and rotation shown, the viewing area is the upper left quadrant as seen from the front. I put the wheel support and motor on a separate platform out front, but they could be located above or under the set.

The wheel shaft turns in ball bearings that are a light press fit in counterbored holes of wooden arms. One end of the shaft is threaded for clamping nuts that hold the wheel between two plastic washers. The wheel must turn freely and run dead true.

Speed. Color fields are transmitted at the rate of 144 per second. Multiplied by 60 seconds and divided by 6—the number of segments in the wheel—this gives you 1,440 r.p.m. as the necessary wheel speed. Choose motor and shaft pulleys to drive the disk at this speed. (Pulley diameters should have the same ratio to each other as exists between motor speed and 1,440 r.p.m.).

The motor I used ran at 1,550. Standard V-belt pulleys don't come in the right sizes to belt this speed down to exactly 1,440. I used an approximate ratio, a 3½" pulley on the motor and a 4" one on the shaft, and then adjusted it by adding strips of masking tape in the pulley grooves.

I use an endless sewing-machine belt of round cross section, having found that even a small V belt added too much extra load. A round rubber vacuum-cleaner belt is another possibility.

Braking the wheel. Adjust the spring-loaded brake so it applies just a little more pressure than you need. Then only a little thumb pressure is required to make the wheel run at the right speed. The brake cable is an auto choke cable fitted with a wooden pistol grip.

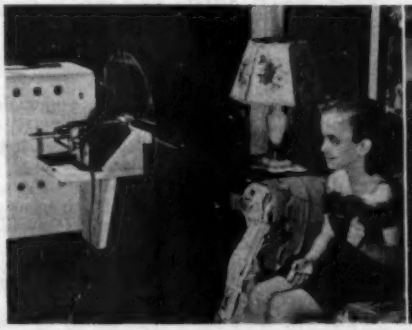
Brake. I get best results by belting the wheel to turn a bit over 1,440 r.p.m. and then applying light brake pressure to pull it down to "sync." A loop of leather riding in an extra pulley on the wheel shaft is tightened by an auto choke cable fitted with a wooden pistol grip. The cable is spring-loaded to apply more braking pressure than you need, so that a light touch of your thumb holds the wheel in "sync."

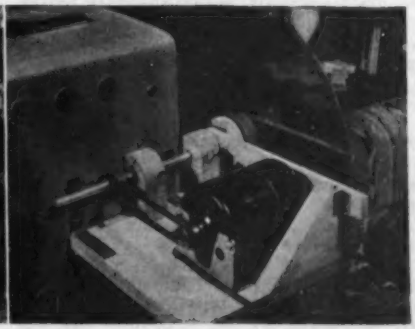
Adjust the pulleys with tape to run the wheel a little fast, and adjust the brake to drag the wheel down a little too slow in the hand's-off condition.

With some practice you'll find it isn't hard to hold the synchronism and color phasing pretty reliably. END

Color Unit Can Be Bolted to Housing of Small Set

MY LITTLE girl was so delighted with color TV in our living room that she wanted more of the same on the 7" set in her room. The one I built for her is like the big unit, except the brake is a little different. This brake is hinged at one end. A piece of leather is cemented to the other end. The leather rides against a wooden disk mounted on the shaft behind the wheel. A piece of cord with a spring on one end provides wheel-speed control.—*Herbert Pfister, New York City.*





How to Buy a House

Here's what a professional appraiser looks for. Using his methods can help you get your dream house instead of a home-owner's nightmare.

Exterior Check List

☐ **1.** Get a close look at the roof—with field glasses if necessary. Are shingles missing, or wooden ones curled or split? Leaks are on the way. If any nails show, count on repairs.

☐ **2.** Look for flashing in the valleys where roof slopes meet, and around dormers, skylights and vent pipes.

☐ **3.** The chimney should be at least 2′ above the roof peak, if it straddles it as shown, or 2½′ if it's on one slope. Jab between the bricks with an ice pick if you can reach the chimney. Crumbly mortar may mean it should be rebuilt.

☐ **4.** Proper flashing is very important around the chimney. If it looks at all suspect, check inside the attic for leaks.

☐ **5.** Rustproof gutters are needed at all the eaves. See if they're sound and tightly attached. If they're painted, a magnet will reveal iron. Copper, zinc or aluminum is much better.

☐ **6.** Do downspouts drain away from house through a pipe, or at least onto splash blocks that will carry water away from the foundation?

☐ **7.** Is there sheet-metal flashing above each window between outside trim and the wall?

☐ **8.** Chief tipoff about wood siding is the condition of the paint. Blisters and alligator checks mean old paint must be removed before repainting. Blistering also suggests water has worked in behind the surface. Is siding tightly fitted at the corners? A mitered joint is best. If old paint is smooth, but dull, chalky, or showing wood, you may have to repaint. Examine bottom pieces of siding for decay.

☐ **9.** Stucco walls should consist of two coats of Portland-cement stucco on wire lath (not wood). Do the specifications call for this? Hairline cracks are nothing to get excited about, but larger ones, or loose patches or soft and crumbly stucco, are trouble signs. Check foundation walls below large cracks, both inside and outside the house, for other evidences of settling.

☐ **10.** Storm windows save fuel and add to winter comfort. Screens are a must in summer. Are both provided, and what shape are they in?

☐ **11.** Has wood trim been kept painted? If not, has it weathered badly? Replacement of rotted sills can be costly.

☐ **12.** Ghosts will walk on windy nights unless shutters have good, substantial fasteners.

☐ **13.** Do the sill cocks have inside shutoffs to prevent freezing in cold weather?

☐ **14.** Jab the mortar in brick walls the same as in a chimney. If you see a bulge in a wall, or a long horizontal crack, count on immediate repairs. Efflorescence, a whitish deposit on the brick, means little on new work, but may be due to water seeping into masonry joints if it appears on old walls.

☐ **15.** The foundation walls should be waterproofed, or provided with drain tile, where soil

moisture is high or water drains to the house.

☐ **16.** Foundation footings should be generous. You can't see them, but cracks in foundation walls are tipoffs to undue settling.

☐ **17.** Termite shields are nice to have anywhere, and vital in some parts of the country. What's the local dope on termites?

☐ **18.** A good porch adds living space. But look for sagging floor or roof, posts rotted at the bottom and shaky steps. Any signs of leakage under the porch ceiling? If space under porch is enclosed, have ventilation openings been left? Can you see whether joists are sound?

☐ **19.** Is the front door big enough to get your grand piano through? Try your magnet to see if hardware is only steel, plated over.

☐ **20.** You can't see framing, but look at the blueprints and specifications. Studs should be doubled at both sides of every door and window opening.

☐ **21.** Over wide openings, like a picture window, framing should be reinforced with trussing, or cornerwise braces like these.

☐ **22.** Headers (horizontal members) should be doubled over doors and windows, and set on edge, not flat, for maximum stiffness.

☐ **23.** Specifications should call for corners to be built up of three studs.

☐ **24.** Wood bracing adds rigidity to the frame. Although you can't see it, the blueprints should show whether it was specified.

SO MUCH time, thought and money go into buying a house that you naturally hope it'll be for keeps. But whether you'll be happy in it or sorry you ever saw the place may depend on how much know-how you apply to the deal.

Driving around the block and kicking all four tires is no way to buy a used car. Nor does sampling the view from a house and measuring the basement for your model railroad justify signing a mortgage. If you're smart, you'll plead writer's cramp until you can go over things from cellar to attic.

Take this check list with you, and you'll have a pretty good idea of what to look for—and whether to buy or run.

Don't be stampeded by the tale that others are in a frenzy to buy the place. It probably isn't true, but if it is, they're taking a risk you'll do well to duck. You should ask a lot of questions besides, "Where do I sign?"

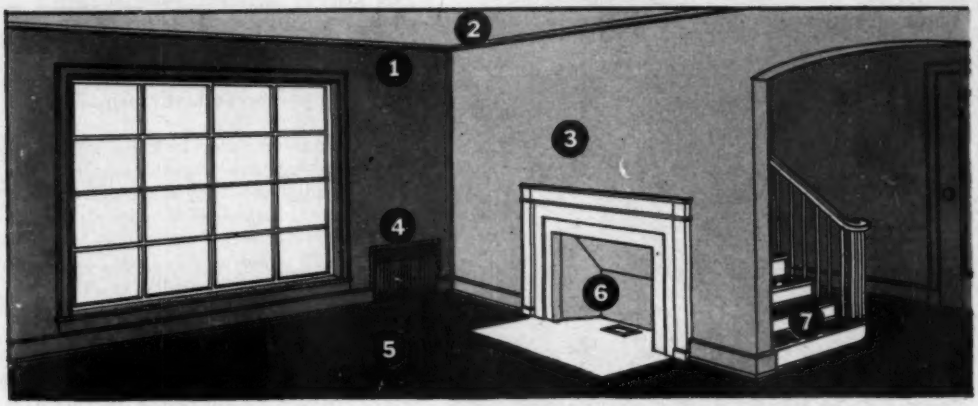
An obviously important one is why the house is for sale at all. Owners and real estate agents may not admit the real reason. Try asking the neighbors, the plumber or the man who delivers the milk. After all, you may not want to put up with bad rainy-weather roads, a monster fuel bill, termites or a spring in the cellar any more than the present tenants.

Appraise it yourself. If you're serious about a house, take the time to look it over critically. Whether you buy it or not, you can mentally pay yourself a whopping appraisal fee if you do a thorough job, for the right decision either way means money in your pocket.

Banks and mortgage companies hire professional appraisers to decide whether a building is a safe risk. This check list shows the construction details an appraiser looks for. Of course, there are other factors—the character of the neighborhood, the trend of values in the vicinity, accessibility to schools and stores, zoning ordinances and so forth. These are important, too, but the $64 question is still "How good is the house?"

It won't be perfect. If you find a house that scores 100 percent on this list, better pinch yourself, for you'll be dreaming. The perfect house doesn't exist. But the list should help you know what to look for, and how to judge what you find.

Of course, not all the points on the list are equally important. Flush tanks that dribble, broken screens, hairline plaster cracks or even a worn-out water heater



Interior Check List

☐ **1.** Are there any cracks larger than hairline size at the ceiling line, in corners or above wide openings such as picture windows and archways? Suspect weak framing, if nothing worse.

☐ **2.** A bulging ceiling may have pulled loose from the lath. Push against it cautiously. If you see it give, expect to pay for a plastering job before long. Inadequate joists under the second floor may be the cause of falling plaster, and there isn't much you can do about it, except eventually to put up a wallboard ceiling.

☐ **3.** Cracks in walls may have their roots in the cellar, in the form of faulty footings under bearing posts, or single joists instead of doubled ones under bearing walls, or in settling foundation walls. So check downstairs if wall cracks are large. How's the wallpaper? Damp spots may indicate the weather is getting through somewhere. Big areas that are peeling or blistered mean you'll have to repaper, at least.

☐ **4.** Is there a radiator or register in every room, and are they good sized? Small ones mean you'll wait longer for the house to warm up on winter mornings. If radiator enclosures are provided, are they well designed to aid instead of hinder air circulation? Any signs of leaking under radiators?

☐ **5.** Inadequate joists can make a roller coaster of the floor. If your eye isn't sure, see whether a marble will roll. Squeaks and bulges may be due to poor nailing. Gaps between floor boards show they weren't thoroughly seasoned when laid. It's possible to lay a new floor right over them, but you'll have to foot the bill.

☐ **6.** Fireplaces give a homey touch, but peek up the flue. If lining is broken, mortar deteriorates fast. A flashlight and mirror come in handy for this. The hearth should extend at least 20" from the front of the fireplace. Does the fireplace have its own damper? A clean-out door in the basement? The only way to be sure the draft is adequate is to light a fire.

☐ **7.** Is the staircase amply wide (36" to 40")? Are stair treads level and well nailed? See if they squeak when you step heavily on them. Shake the handrail. It may have to keep somebody from falling. Is it up to the job?

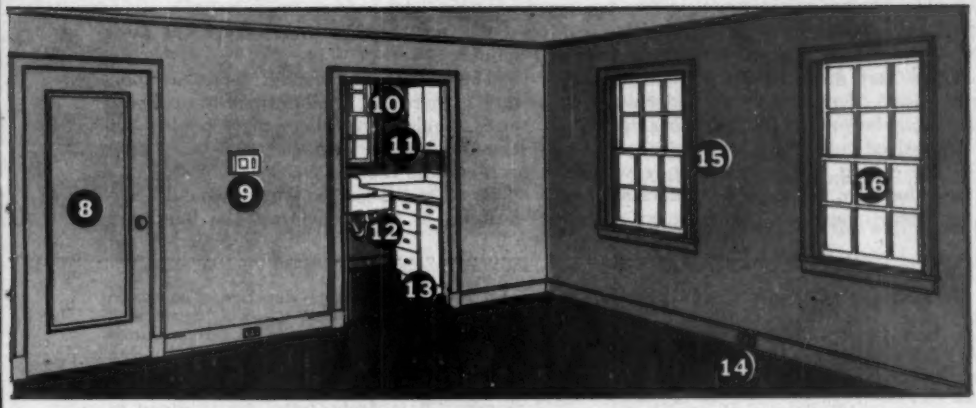
☐ **8.** Try several doors. If they swing open or shut by themselves, they're not plumb, which

needn't keep you from buying an otherwise good house. But knowing what's wrong, and what it will cost to set it right, is important.

Trivial things may be a tipoff to the quality built into the house. If the builder used plated-steel hardware on the front door, for instance, instead of brass or bronze, he may have skimped on even more important matters. Sleazy lighting fixtures are another warning of penny pinching. On the other hand, if windows are hung with chains instead of the usual (and acceptable) sash cord, the place probably wasn't built to a minimum budget.

The quality of plumbing fixtures, door latches, cupboard fittings and other interior hardware may also have something to tell you. But remember that old fittings of good quality, daubed with uncounted coats of paint, may look worse than cheap newer units. Electrical outlets, once deemed a luxury, have been out of that class for years. If those you see are limited to lamp cords strung from the nearest bulb socket, somebody tried to skimp where it hurts.

Bashful about prying? Many a buyer is embarrassed about asking pointed questions or peering into the crevices of a house. But if you think you look silly prodding a cracked ceiling, consider how much sillier you'll feel if it drops on your mortgaged shoulders.



suggests settling has pulled the jambs out of line. A tapering gap between door and saddle may also show this. When a door is closed, you should still be able to slide a piece of paper all around between it and the frame. If you can't, doors may bind in humid weather. Door hardware is another tipoff to over-all quality.

☐ **9.** Check the thermostat location. It shouldn't be near an outside door or a window, over a radiator or register, or in drafts. The clock type will let you awake to a warm house.

☐ **10.** Are kitchen windows adequate for ventilation and light? And lighting fixtures ditto for night illumination? An exhaust fan will be a plus feature, if there is one.

☐ **11.** Are electric, gas, water and waste outlets located where you'll need them for the range, dishwasher, refrigerator or other accessories you'll be using? If not, figure on extra installation bills. If you plan on an electric range, remember you'll need a heavy-duty circuit to plug it into.

☐ **12.** Try the faucets. If they're obviously antiques, figure on eventual replacement. If water runs red, pipes may be rusted badly enough to need replacement. Does the sink drain promptly? Is the enamel chipped or stained?

☐ **13.** Cabinets should be convenient to reach, sufficient in number and capacity, and with adequate toe space under them. Your wife is the one to pass on these, the breakfast nook, the gas stove and the general kitchen layout. She's the one who has to live with them.

☐ **14.** Baseboard outlets are badly missed if they aren't around. One per wall is none too many for convenience. Of course extra ones can be added, but they won't be free.

☐ **15.** Dust streaks alongside windows may indicate building paper wasn't used under the sheathing, or that the sheathing wasn't well fitted around window frames. Water stains under window? The frame may be loose or a joint open. See walls of the room just below for telltale marks.

☐ **16.** Open and shut some windows. Broken sash cords aren't serious if you're handy with tools. If windows stick, see whether it's because of old paint, swelling in damp weather, or from settling that has pulled window frames out of square. Have the sash rotted at the bottom?

The real estate agent may shrug off your questions. But he isn't going to make any refunds if things aren't just as you hoped. Your own eyes are more dependable than somebody else's tongue. Trudge hard up the stairs to find out if they squeak, squeeze into the attic to see whether the sun pinpoints roof leaks, and jab the cellar joists with an ice pick if you suspect termites. Otherwise you may be sorry.

Will it stay put? You can count on repainting, redecorating and routine upkeep chores to go on forever. But is settling over, or will the cracks you patch be bigger next year? If foundation or chimney footings are undersize, repairs may not be permanent. Appraisers take the age of the house into account. If it's five or six years old and there are no serious cracks, they assume settling is over and the house will stay put.

You can learn how old the structure is by going to the hall of records or, more easily, looking for a tag on the gas meter. Such a tag shows the date the meter was installed. It may be the second—or tenth—meter that's been put in, so the house may be older. But the tag gives you its minimum age.

Handwriting on the walls. Except in the cellar and attic, you can't see the all-important framing that is the core of the house. But walls, ceilings and floors offer

clues to what's really going on underneath.

Wrinkled or stained wallpaper, for instance, may mean roof leaks—and roofs are expensive. If the stains are under windows, sills may be rotted out or flashing defective. Good-sized cracks in plaster walls, a crevice at the ceiling line, over a picture window, or a doorway, all suggest insufficient framing. Remember to check the room directly above, too. Is there evidence of the same faults?

The cracks may extend there, or floors may sag off level, another tipoff to undersize joists, single studs where they should have been doubled, or not enough bearing posts or a settling foundation.

By all means get the blueprints and specifications of the house from the builder if

Basement Check List

☐ **1.** Is there a ceiling in the cellar? It's a good feature, but if possible, look past it to see what you can of the framing details.

☐ **2.** Joists should be at least 2" by 8", for spans up to 12'. Beware of many knots, especially open knotholes in the lower edges. Spans longer than 13' call for 2" by 10" or even heavier joists. In any case, joists should be spaced 16" apart.

☐ **3.** Bridging is important. It consists of short wood or metal members nailed X fashion between the joists, enabling them to carry their load without deflection. Joists should have bridging about every 6' to 8'. It should fit well and be nailed firmly.

☐ **4.** Subflooring should be laid diagonally for maximum strength, with building paper over it, under the finish floor.

☐ **5.** Ends of joists should rest at least 3" on the sills. If they hang by a hair, so will the house. Sills should be bolted to the foundation.

☐ **6.** One end of the joists usually rests on a girder. This may be a steel I beam, or a 12" or larger timber, and should bear for at least 4" on masonry at the ends. Joists may rest on it or may be hung by steel stirrups or on ledger strips bolted to the girder. Long, grainwise cracks in a wood girder don't affect strength.

☐ **7.** Girders should in turn be supported between foundation walls on bearing posts or lally columns. These should stand on concrete footings—in the case of wooden columns at last 3" above the cellar floor.

☐ **8.** Is the stairway hanging by its nails at the top? It should have a bearing post, or at least doubled joists, and doubled headers bridging the joists. Joists around a chimney or other opening should be doubled, too.

☐ **9.** Look for doubled or tripled joists directly under bearing partitions that support joists of the floor above—or for the cracked plaster their absence invites. Where joists and headers are butted, see if they're simply toenailed or if the lighter member is hung securely on the other by strap hangers.

☐ **10.** Test water pipes with a magnet to learn if they're iron, or copper or brass.

☐ **11.** Run laundry taps. Is the water clear, or does reddish tinge warn of rusted pipes? Shut off faucets suddenly, to see if there is water hammer. Nice not to have, both because it's annoying and because it strains the plumbing.

☐ **12.** The waste pipe should have a clean-out plug wherever it changes direction. You should know whether it goes to a sewer, septic tank or cesspool. Cesspools may be dangerous sources of contamination. A good septic tank of metal, tile or wood is all right. It must have an adequate drainage system and manhole covers for cleaning. If in doubt, better get an expert to check. Are there large trees near the pipe? In dry spells, they may send roots into the joints. A root-clogged waste pipe spells expense.

☐ **13.** Steam pipes should have some pitch to avoid accumulation of water in them. Both steam and hot-water heating pipes should be jacketed. In gravity hot-air systems, ducts should also pitch downward slightly toward the furnace. Insulation on these isn't important, but they should have dampers near the furnace.

☐ **14.** Is the hot-water heater big enough? Independently fired or hooked to the furnace? If the former, is it properly vented to the chimney? If it's a furnace take-off, is there an additional heater for summer use or an aquastat for control independent of the thermostat? Primitive equipment may have to be replaced.

☐ **15.** Be suspicious of cracks around the smoke pipe. The chimney may have no footing of its own, or a poor one. Is there woodwork near the chimney or furnace? If it gets too hot for your hand, it's a fire hazard.

☐ **16.** Is there a clean-out door for the fireplace, placed low enough for easy cleaning?

☐ **17.** You'll love or hate the heating plant, come winter. Is it modern, or if old, of a make you can still buy parts for? Is it big enough for its job? Do water gauge, check damper and pressure control seem to be in working condition? Has a hot-air furnace a return duct or merely an opening at the bottom?

☐ **18.** Open the clean-out door of a steam or hot-water furnace and scrape some soot from around the flues. Any sign of corrosion or cracks? Very heavy soot deposits suggest either neglect or a poorly working oil burner. In a conversion job, warped or sprung doors may spoil the draft. In a coal furnace, are the grates sound, and do they shake readily?

☐ **19.** Look for rusting around the base of the furnace. It may be due to boiler leaks, or to flooding of the cellar by rains.

☐ **20.** Is the oil burner above water seepage? It shouldn't be set in a pit. Run it, if possible, to check for fumes, smoke or excessive noise. Oil stains on the floor may be from leaking lines.

☐ **21.** Pour some water into the floor drain to see if it works. Cracks around the drain may

you can. They show at least what the house was meant to be, and if visible details check out, you can feel more secure about the unseen essentials. The reputations of the builder and the architect may be worth considering too.

This check list is arranged roughly in the order in which you'll be able to observe things. Use the boxes at the left of the items to check them off as you go, and the key numbers to identify your own findings and comments in a notebook. Notes are the only means of remembering everything, especially if you look at more than one house in an afternoon, so get yourself a pocketful of sharp pencils.

Shutters help dress up a house. See PS next month for several ways to make them.

Please turn the page for the attic check list

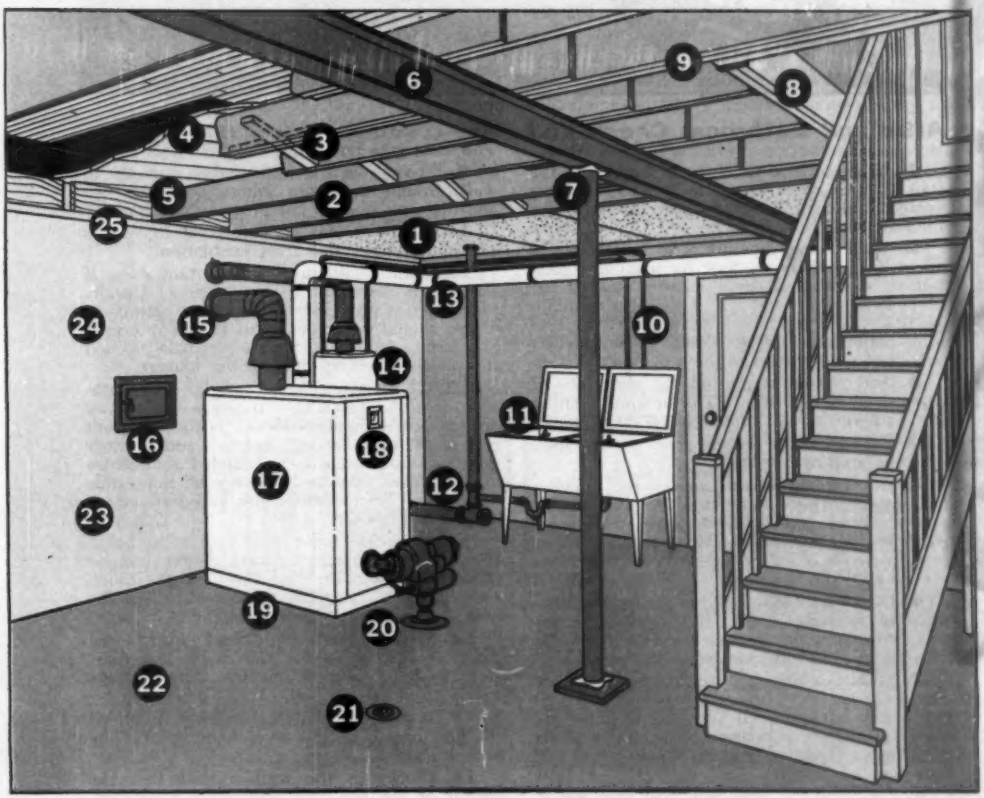
mean water has backed up under the floor some time in the past. Not good.

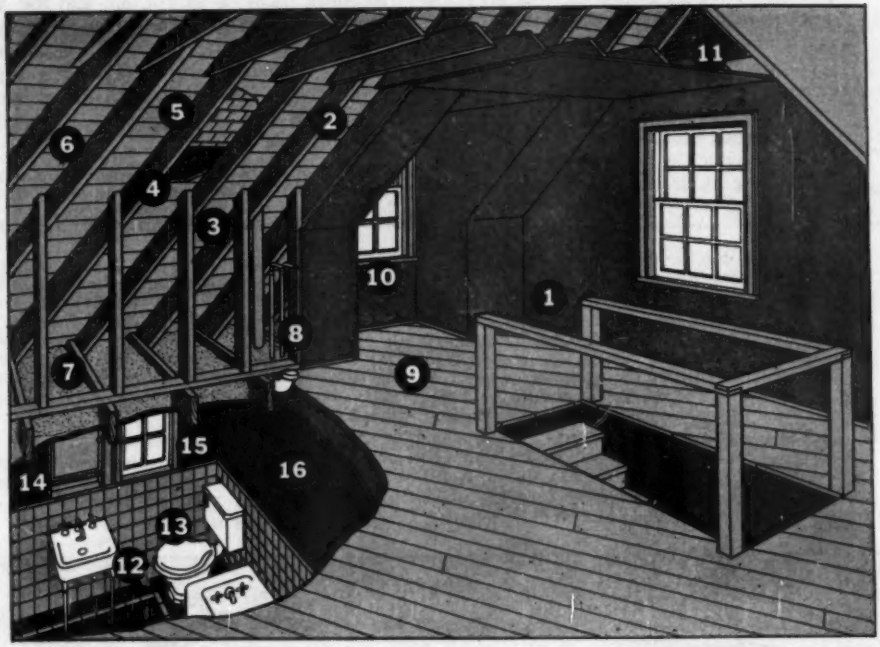
☐ **22.** Tap the concrete floor lightly with a hammer. Dull thuds are fine; hollow ones suggest the slab is thin or has been undermined. If large, such areas may break up. Wet spots in basement walls or floor suggest that water collects outside those places. Look also for high-water marks on the walls as signs of flooding.

☐ **23.** Look at foundation walls from the inside. Cracks here betoken insecure footings, and probably repeat themselves in upstairs walls.

☐ **24.** Mud or clay tunnels, the size of a pencil, on masonry or wood are built by termites. Usually on the outside, they may appear indoors if the pests have entered through cracks in the masonry. These tunnels are danger signs. Poke suspected timbers with an ice pick to see if they're solid. Unless familiar with termites, better get expert advice if you find such tunnels. Chances are the house is a risky buy. Carpenter ants also weaken timbers. If you see any, use the ice pick freely.

☐ **25.** Fire stops may be seen at the ends of the joists where they rest on the sills. They normally retard the circulation of air, improving the insulating value of the walls, and in case of fire retard the spread of flame.





Attic and Bathroom Check List

☐ **1.** If the attic is to be good for much, the trap door or other access to it must be large enough to get furniture and boxes through. Has the stair well a guard rail?

☐ **2.** Sight along the rafters to see if they're all in line. Otherwise, look for a sagging roof. Rafters should be 2" by 8" at least, spaced 16" on centers, or at most 24" if the attic is unfinished. They should be notched over the sidewall plate and spiked down. See whether they're of sound wood, without many knotholes.

☐ **3.** Are rafters supported on short studs? These should rest on a plate, or long member laid on floor or joists, not right on the floor.

☐ **4.** Do any of the timbers show discoloration or stains from roof leaks?

☐ **5.** Are roofing boards under the shingles tight-fitted? The deluxe kind are tongue-and-groove. Roof boards should have waterproof paper under the shingles. Many builders skimp here by laying shingles right over furring strips spaced a few inches apart.

☐ **6.** On a sunny day, look for daylight through the roof to detect leaks. If it's raining, drips may be some distance from the actual leak, or may be soaking into a plate at the rafter end.

☐ **7.** Attic insulation is all to the good. It may be in the form of batts, loose fill or reflective (foil) insulation. If you plan to finish the attic immediately, insulation between the rafters is all right. If not, it is more effective between floor joists, as here.

☐ **8.** Finishing the attic will cost you less if heating, water and waste pipes are already in. The same goes for wiring.

☐ **9.** Flooring in the attic makes it easier to walk around and store things, and puts you ahead if you plan to put in living quarters.

☐ **10.** Dormers may be important to you to provide daylight and cross ventilation.

☐ **11.** Attic ventilation is important even if you don't use it for living quarters. Usually ventilation is provided by louvers at both ends. These should be screened to keep out insects and birds. Attic windows are especially needed if a finished ceiling encloses the louvers.

☐ **12.** Check the quality and kind of bathroom fixtures. You'll have to live with them, or spend a lot to replace them. Is the tub built in? Is there a shower? Are tub and lavatory vitreous china, or cheaper enameled iron? Stains and scratches may be hard or even impossible to remove. Try the water flow and drain action in tubs and lavatory.

☐ **13.** A cracked toilet bowl must be replaced. If there isn't water in the tank, better examine it closely for cracks. You can flush the toilet, even if the water is turned off, by filling the tank from a pail. It's worth doing to be sure.

☐ **14.** Will the medicine cabinet bulge before you've found room for the family supplies? Does it have a good mirror, with adequate shaving and makeup lights?

☐ **15.** Is there adequate bathroom ventilation? It's best not to have a window right over the bath or shower.

☐ **16.** Cracks in the wall suggest that the weight of the tub isn't adequately supported.

I Put in My Own Oil Burner

By E. F. Lindsley

A week-end's work enabled this home owner to resign from a lifetime job of shoveling coal and ashes.

WHEN the drudgery of tending a hand-fired furnace got me down, I used to dream of an automatic oil burner. No barrels of ashes to lug, no thrice-daily fire tending, no fly ash floating around.

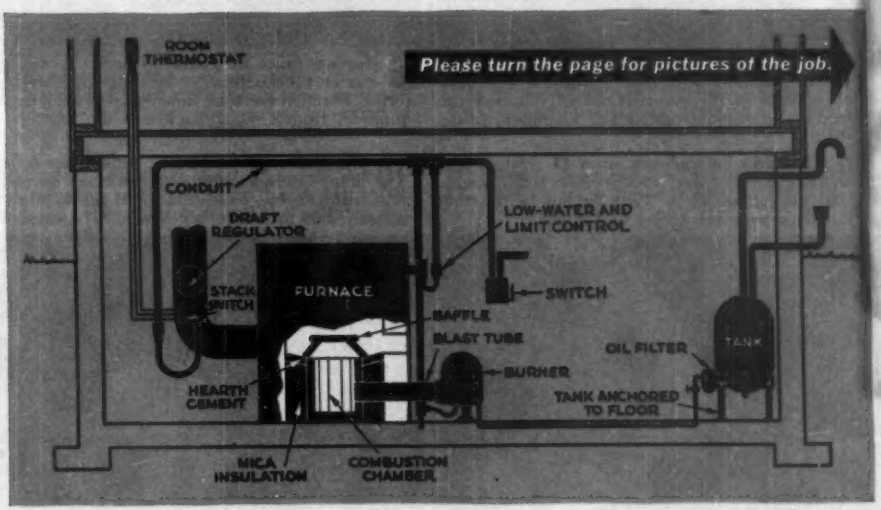
Buying an oil burner and paying for installation would come pretty high. How tough a job, I wondered, would it be to install a mail-order conversion kit myself? Could I do a job that would be shipshape, work well and—above all—be entirely safe?

It wasn't hard. With some misgivings, I tried it. The installation took me two and a half days of solid work, but called for no more technical skill than plenty of automotive and handyman jobs. The directions with my kit were so complete and detailed that any tool-wise man should make out okay.

When I was through, I called in a regular burner-service man to check my work and test stack temperature and CO_2. He gave my rig a clean bill of health.

If you're tempted to try the same job, these pointers may help:

- Don't expect a burner to remedy basic defects in a coal-fired heating plant. If furnace, stack or chimney are undersized or beat up, an automatic burner won't magically correct them.
- Get a burner and combustion chamber suited to your furnace size. Make sure the nozzle you get meets the needs of your home, temperature preferences and climate. (Nozzles are rated in gallons per hour. But this isn't actual consumption; a burner runs intermittently.) Kit suppliers will help you figure the right size.
- Investigate local building, fire and electrical regulations before you begin. In some localities, the fuel tank cannot be put in the basement.
- Have a competent oil-burner man check over the work before you fire up. This is obvious good sense for safety. Moreover, he has the experience and test instruments to sharpen up the adjustments until they are just right.
- If the channel in the concrete floor for the fuel line sounds like too much work, you can put in a two-pipe system that runs overhead. But this hookup is often noisier than the under-floor method.

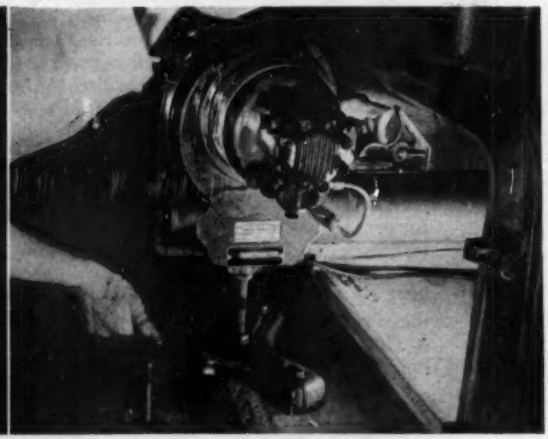


Please turn the page for pictures of the job.

1 Welded 275-gal. tank can be handled by two men if there's room enough. Steel column here had to be moved temporarily. Putting tank in basement is easiest if local codes permit.

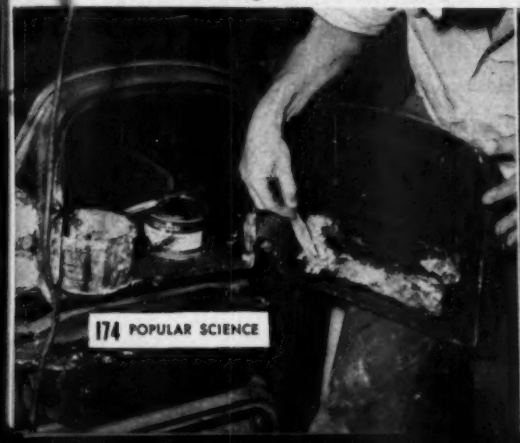
2 Smoke pipe is removed so it and chimney can be cleaned. Pipe is then sealed in place. Oil-burner draft regulation is delicate, and air leaks would make efficient adjustment difficult.

5 Combustion chamber is pre-cast. I tried out assembly and lined up burner and blast tube. To help, my five-year-old son climbed into furnace and reassembled the chamber inside.

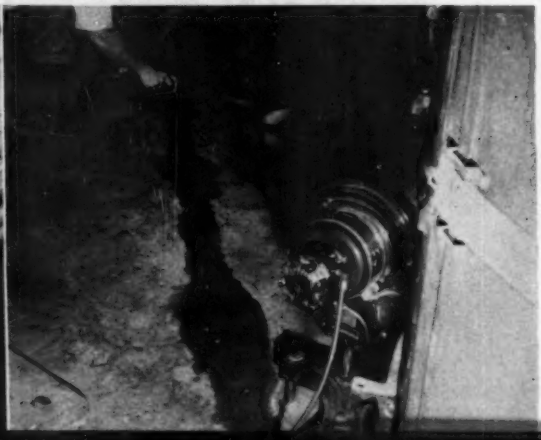


6 Burner must be centered and adjusted so end of tube is flush with inside of chamber brick. I angled the tube downward to keep dripping oil from flowing back into the burner.

9 Air leaks in furnace must be sealed, too. Hearth or furnace cement closes small cracks. Seal uneven doors by filing flat, or by drawing down on asbestos gasket and cement.



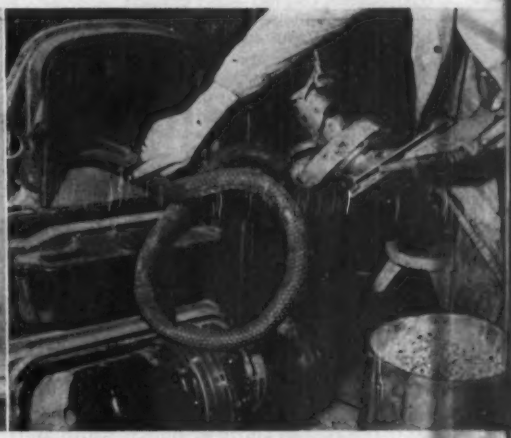
10 Feed line from fuel tank runs under cellar floor. I chiseled a trough for it and covered line with cement. Feed line could run overhead instead, but then two pipes would be needed.



3 Out comes the grate. It's heavy and tricky to handle so I lifted out the individual castings. I also removed the door, using a cold chisel on the rusted nuts and bolts.

4 Wearing a dust mask, I wire-brushed and inspected inside furnace walls and patched small openings with cement. Clean walls allow combustion chamber to be sealed in properly.

7 Bricking up the ash pit. Some codes demand fire brick. The blast tube must not touch the brick or combustion chamber. I packed cement at both places to insulate it.



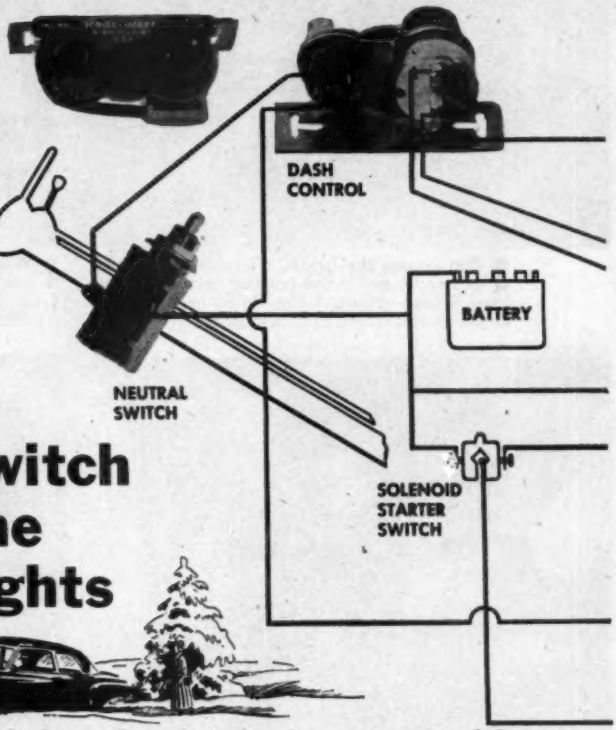
8 Vacuum-cleaner hose attachment blows mica insulation (fed into nozzle) between chamber and furnace wall. Insulation should be packed, covered with 2" layer of hearth cement.

11 Automatic draft control must be installed level and exactly upright. I took pains with this and other controls to get the positions just right and make all fittings tight.

12 Wiring is simple, well explained in installation notes. I tabbed wires with tape before feeding them through conduit. I put in separate fused line to handle burner load. END

NEW ACCESSORIES FOR CARS

2 With key out, dash knob is turned to activate automatic system. Pilot light shows it's on, supplying current to engine unit at A.



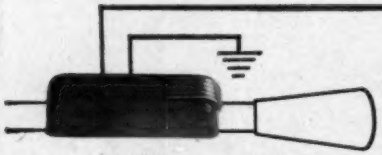
1 Gearshift lever must be put in neutral before engine warmer will work. This closes circuit through steering-column switch to dash control. Starter won't operate if car is left in gear, nor can car be driven without ignition key.

Automatic Switch Warms Engine on Winter Nights

TAKE your key out, turn a dash knob, and this gadget stands by. When engine is cold, the system starts it, runs it warm and shuts it off again. You have a warm engine and car heater in the morning. Gearshift linkage cuts ignition if somebody tries to drive off. The rig even gives key starting.

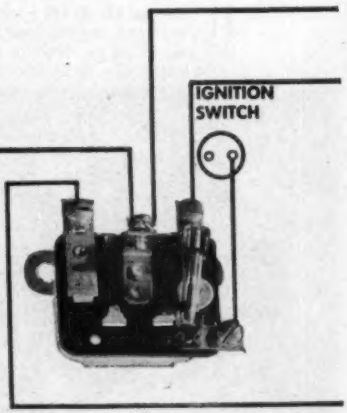
Made by Cray-Lincoln Co., Inc., North Walpole, N. H.

Hill Holder Gives Your Braking Foot a Rest

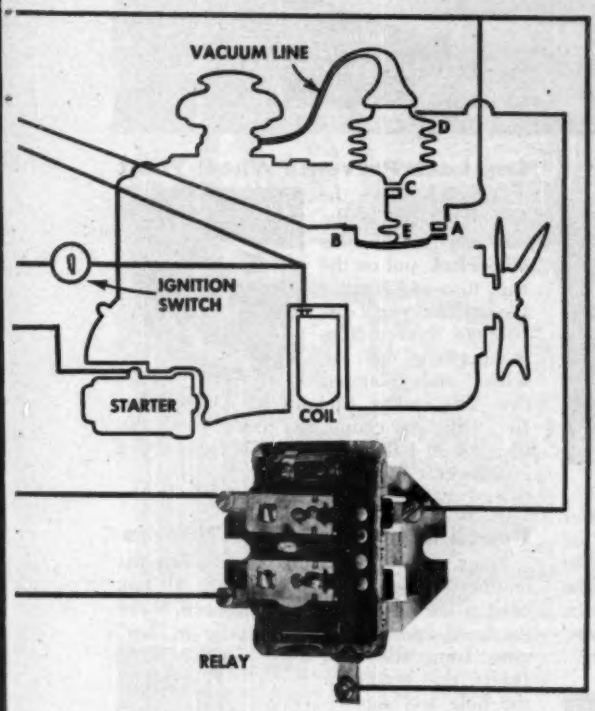


1 Pressing a switch clamped to shift lever while holding down brake pedal with your foot puts a new hill holder into operation.

2 Switch actuates magnetic relay, right, completing electrical circuit that operates holding system. The relay is heart of system. Juice is fed in by power wire from accessory side of ignition switch. Relay is mounted on firewall.



3 **As engine cools toward freezing,** thermostat at bottom of unit mounted on cylinder head snaps shut, closing contacts A. Current flows from B through dash control to coil, and through closed contacts C and D to the relay unit and the solenoid starting switch. Thus engine is cranked with ignition on.

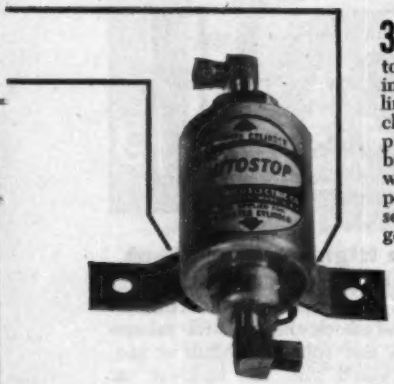


4 **When engine starts,** manifold vacuum contracts a bellows-like brass element, opening contacts C. This cuts juice to the solenoid, and starter stops cranking. Vacuum keeps C open as engine runs. Ignition stays on through A and B.

5 **When engine is warm,** thermostat clicks open, breaking ignition at A. Contacts C close as vacuum drops, but starter doesn't run because circuit is open at A. Cycle repeats when the engine cools off. On a cold night, system turns engine on several times.

6 **If engine fails to start,** a heating coil at E, receiving current through the solenoid starting circuit, warms thermostat until it clicks open. After the thermostat has cooled off, the system makes another starting try.

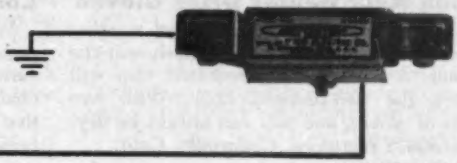
7 **After two or three tries,** a time-delay unit in the relay activates a circuit breaker on the dash control. This opens, turning off all current to the system and its pilot light. A reset button on the dash unit must be pressed to put the engine warmer back in operation.



3 **With circuit** complete, current flows to a solenoid valve, left, installed in hydraulic line to rear brakes. Valve closes and holds fluid pressure — keeping brakes on—just as if you were holding down the pedal. Brakes remain set as long as current goes to solenoid valve.

4 **Ready to go,** you simply step on accelerator. Throttle switch (below) then operates, breaking the holder electrical circuit. Relay relaxes, solenoid valve opens, and brakes are released—all in a split second before throttle gets car under way. The switch is installed in place of section cut from throttle rod. Pressure on rod causes two switch parts to pivot slightly, opening contacts.

Made by Wico Electric, West Springfield, Mass.

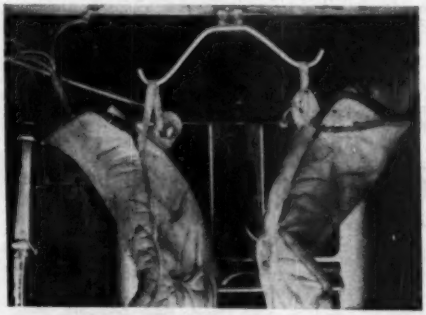


Slotted Stick Helps Polish Car Top

To REACH that no man's land in the middle of the top while you are cleaning or polishing your car, cut a slot about ¼" by ½" by 3" in the end of a 36" stick and thread the polishing cloth through the slot.—*Walter E. Burton, Akron.*

Fender Welts Are Driven In

FENDER welts found on most of the older cars are easy to replace if they have rotted away. A new replacement welt now on the market is simply driven into place after the old one has been pried out. The welts, made by Marson Corp., Revere, Mass., come in either black rubber or chrome.



Hook Near Heater Dries Gloves

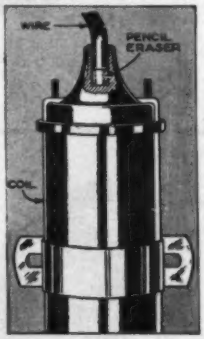
TRUCK drivers who work in wet weather can dry their gloves under the dash near the heater. A sheet-metal screw and clip will fasten the two-pronged hook. With two pairs of gloves, one pair can always be drying.—*Keith Heryford, Cedarville, Calif.*

Lug Lock Prevents Wheel Theft

TIGHTEN up the wheel nut inside the cup section of this wheel lock, put on the cap, turn and remove the key, and you'll discourage thieves from making away with the wheel and mounted tire. The maker, Richard M. Decker Co., Inc., Chicago, claims the lock doesn't disturb wheel balance. About $8 for a set of four locks.

Pencil Eraser Foils Car Thieves

HERE's a way to "lock" a car when the ignition or door locks don't work. All you need is the eraser from a lead pencil. Raise the hood and remove the middle or "hot" wire from the coil. Insert the eraser in the hole and replace the wire. (A dangling wire would be conspicuous.) The eraser will keep current from flowing to the distributor, preventing anyone from starting the engine. Remove the eraser from the hole with a pin.—*William B. Eagan, Louisville.*



Locating a High-Pressure Leak

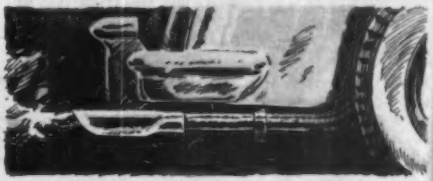
WHEN a water bath fails to reveal a high-pressure leak in an inner tube, bend the valve stem and check the base for minute chafing marks and splits. As often as not, that's where you'll find the leak.—*A. A. Jagiellowicz, Ansonia, Conn.*

Protecting Your Car's Body

Bumping-out and repainting jobs come high these days. It will pay you to avoid them by heeding these tips.

Watch fore and aft while parking for projecting objects that might hit car above bumpers. Higher bumper guards will help. Curb feelers, fender markers are also sound investments.

If your garage is narrow or someone in family is learning to drive, put up bump pads where car might scrape. Nail pieces of old tire casing on door-frame corners and on garage wall where swinging car door hits.



An exhaust extension to carry fumes beyond car will help protect rear areas. Sulfur in exhaust gases may corrode metal near tailpipe.

Undercoating, especially on the fenders, will prevent much rust, but even so edges may chip easily and should be touched up promptly. Door bottoms are another trouble spot, often scraping paint when opened over high curb. And watch your tire chains, too—broken crosslinks let them flap against the fenders, causing dents.

In diagonal parking, watch out for swinging doors of adjoining cars. If your car lacks rub strips on the sides, the door of another car can chip your paint and dent the metal. If you can't park far enough away to keep a swinging door from hitting you, park fairly close so it can move only short distance and thus will carry less force.

Button Up Your Car for Winter

When icy winds whistle around your car, you'll appreciate these seal-up stunts that can make you snug.

By Bob Gilmore

Here's where drafts come from. Metal lip on door often becomes caked with rust. This damages and tears away sponge-rubber gasket on body. Remove gasket with putty knife, clean off rust with wire brush, repaint door lip.

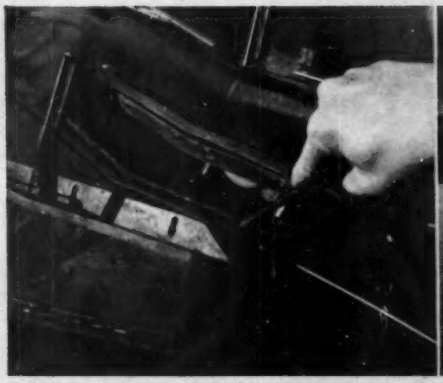
IF YOUR car is more than a few months old, it will very likely be damp and drafty in the bitter weather to come. Its heater will work overtime bucking heat losses around doors, windows and ventilators.

These leaks are easy to fix. In a couple of hours you can button up your car so it will be leakproof right around the calendar. You need only simple tools and a few dollars' worth of materials. Pre-formed gaskets can usually be bought from auto dealers.

Because of monoxide and oxygen-depletion hazards, always drive with at least one window or vent cracked open a trifle.

Apply new door gasket after coating frame and back of gasket with weather-strip cement. Let cement dry about 10 minutes before pressing gasket in place (above, left). Then close door on gasket to hold it firmly until cement sets.

In many cars, side weather stripping of the doors is a tubular rubber-and-fabric upholstery trim. In time it will no longer lie tight against the door, but it is expensive to replace. Instead, reseal door with self-adhesive sponge-rubber strip pressed in place on door frame or lip. First clean surface with solvent-soaked rag. To avoid touching tacky surface of strip, pull protective facing free just ahead of point of contact. For better adhesion you can apply cement to door first.



Does the cowl vent leak? Rain water may drip on your feet if the cowl-vent gasket goes bad; unwanted breezes will sweep into your car if the side vents don't close tightly. First remove cowl vent and screen. Clean out the old sponge-rubber gasket from the channel, using a screwdriver or a knife to scrape away all rubber and cement down to the bare metal. Finish the cleaning job with a wire brush, being careful not to scratch the body paint around the vent.

Press new gasket into place after applying weather-strip adhesive around edges and bottom of channel. Tuck edges in even and snug with a screwdriver or putty knife as shown above. Adjust the vent to shut tightly against the gasket.

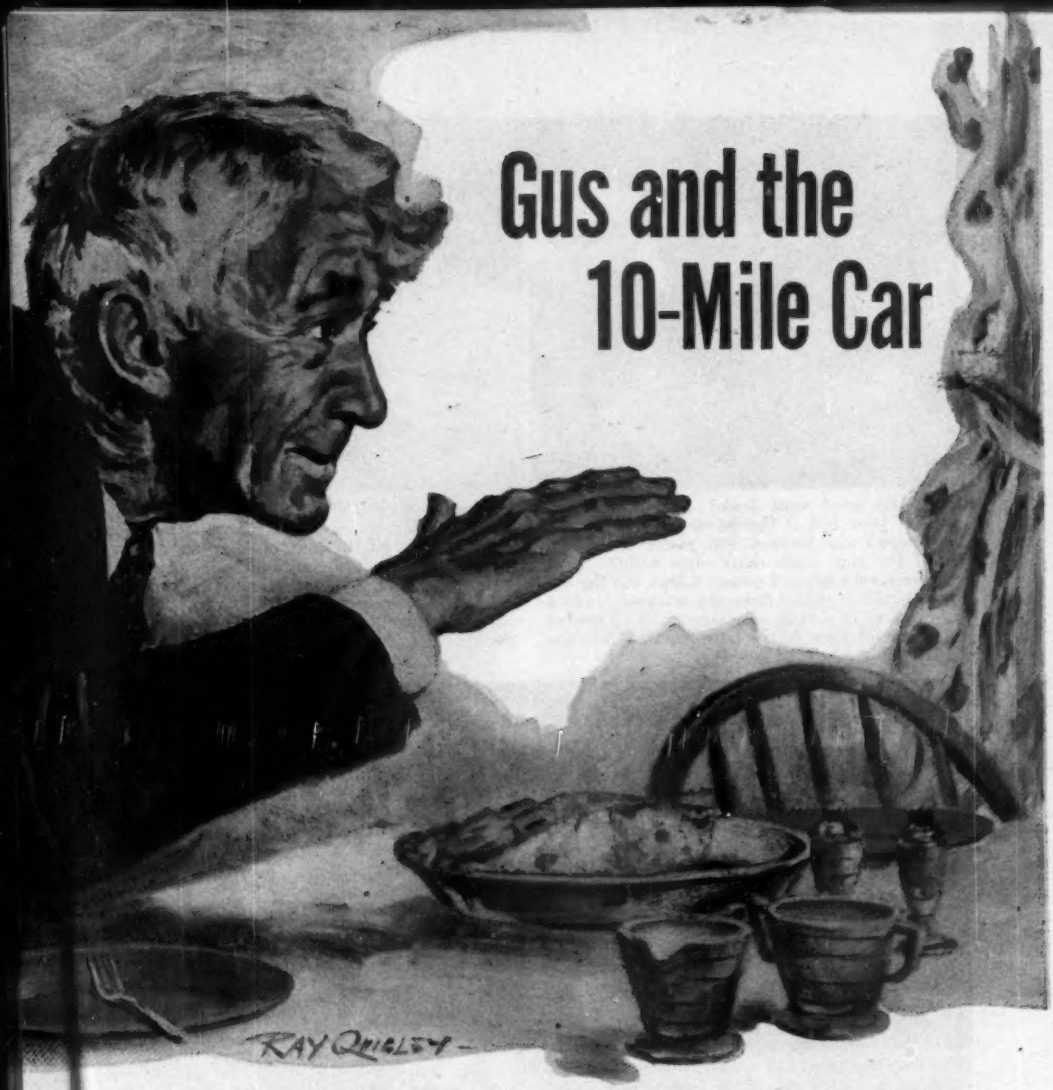
Refitting the glass. Windshields and windows set in rubber let in rain if the gaskets lose resiliency and dirt settles in the grooves. A screwdriver or putty knife run cautiously between gasket and glass will loosen caked dirt. Blow dirt away and wipe area clean with solvent-soaked cloth. Then run a screwdriver along channel (left), forcing gasket out while squirting in clear-plastic sealer. Same sealer will weatherproof fittings where windshield-wiper shafts come through car body.

To shim out rubber gaskets around pivot-opening side windows and make them fit better, use rope-type calking putty. Pull out the gasket with your fingers and press the calking rope behind it as shown above.

If trunk gasket leaks, rip it out and clean channel with a wire brush before cementing in new one. Use putty knife to press gasket edges straight and level. If gasket ends must be joined, locate joint at bottom edge. Seal the joint with cement. All gaskets should be dusted with tire talc (shaving talc will do) to keep lid or door from sticking to rubber.

Final point: if air sweeps up around pedals, cut slits in inner-tube rubber, stretch over the pedals, and cement to floor board under mat.

Next Month: Undercoat your car yourself.



Gus and the 10-Mile Car

Gus spends the night at a fisherman's motel and finds he can't get away from ailing autos—even on vacation.

By Martin Bunn

WAS it the sign, "Fisherman's Motel," or the raised hood of a car parked beside the motel office? Gus Wilson wasn't sure which caused him to apply his brakes and swing off the paving onto the gravel shoulder.

He glanced down at the mileage on the speedometer and told himself it was the sign. Gus was on his way back to the Model Garage from a week's fishing trip, and he was still 200 miles from home. With the sun going down fast, he decided he better stop for the night and get some rest.

At that moment a white thatch of hair rose up from behind the open hood of the car. "Fine weather, ain't?" the man called. "You lookin' for a cabin?"

"Yep, got anything open?"

Gus's feet started toward the car the man had been puttering with, but he stopped them. He had promised himself before he set out on this trip that he wouldn't touch an automobile except to drive it.

"Reckon you can have Number Six," the

As Gus enjoyed the home-cooked meal, he had a strange feeling that the opened hood on the car outside was a sign of brewing trouble.

little man squeaked. "Mighty nice little cabin, right down by the lake."

When Gus had signed the guest book, the gnomelike proprietor helped him carry his gear. "See you been doin' some fishin', Mr. Wilson."

"That's right, up at the Cherry Lakes." But Gus' tone indicated that the fishing had not been all it might have.

Gus Gets an Invite

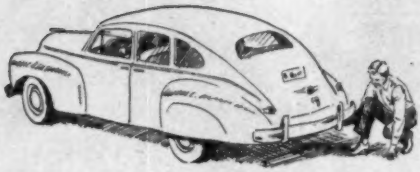
The little man jerked his thumb toward the lake. "Ain't bad anglin' right here. Well, if you'll be needin' anything just give a holler."

Gus had taken off his fishing jacket and had begun to clean up. "Just one more thing. Any place around here where a man can get something to eat?"

"Well, there's a place of sorts up the road, but it ain't much when it comes to choice vittles. Most folks," he said, nodding his white head in the direction of the stove, "cook their own meals. Buy the stuff in our store and serve it up themselves. Got some mighty fine cuts of beef hanging."

"I think I've had enough of my own cooking for awhile," Gus laughed.

The little old man, halfway out of the cabin door, paused for a moment and



rubbed his chin. "Well, if you don't mind eatin' country style, how about havin' supper with us?"

"Thanks, that's mighty nice of you, but I don't want to butt in on a family meal."

"Ain't no family. Just Clara and me. Children all married."

"Well, I'll do it on one condition, Mr. . . ."

"Norton, Ed Norton."

"I'll do it under one condition, Mr. Norton," Gus repeated, "and that's if you'll let me buy the steak—and make it a nice big thick one."

Now Comes the Trouble

After some arguing, Ed Norton finally agreed, and half an hour later Gus found himself seated at a large kitchen table facing a slab of juicy porterhouse, country fried potatoes, fresh corn on the cob, garden tomatoes and Ed and Clara Norton.

"Eddie," Clara said as the three sipped large cups of coffee, "did you get the car fixed today?"

Ed Norton just looked down at his cup and sheepishly shook his head.

"Oh dear," sighed Clara. "We'll never make it to the hospital tomorrow. The way that car's been acting up we won't get more than a few miles before something happens."

"Someone sick?" asked Gus.

"It's our youngest daughter," Mrs. Norton said, visibly upset. "We have a brand-new grandson three days old now and we haven't been to see him yet. We'd planned going over tomorrow if the car was fixed."

He Wasn't Going to Touch a Car

Curiosity about the car plus the warm glow caused by good food and pleasant people were fast breaking down Gus's firm resolve to keep this trip strictly a vacation. Finally he asked, "What seems to be the matter with the car?"

"Blamed if I know, and blamed if I've been able to find any mechanic around here who can tell me and fix it. She just won't perk for more'n about 10 miles."

"Ten miles?" questioned Gus.

"Yup. Runs fine when you first start off, but about 10 miles further on she just ups and dies like somebody reached down and turned off the key."

"We've got to do something," said Clara. "I promised Bess we'd visit her and the baby tomorrow, and I aim to get there if I have to walk the 23 miles."

Gus Gives In

"Now hold on folks," Gus said with a grin. "Maybe I can help out a bit."

The Nortons looked up in surprise.

"I hadn't planned to tinker with any cars on my vacation, but it happens that that's my business. Let's go take a look."

Ed and Clara just stared.

Ed recovered enough to lead the way, and when the two men reached the car Gus slid into the driver's seat and pushed the starter button. The engine took hold easily.

"Now tell me," he said as he headed the car down the road, "what's the story?"

"It started acting up a few weeks ago. I was driving along when all of a sudden the engine just quit. Luckily I was on a hill. I just let 'er roll to the first garage I came to. Man there said the timing was probably off and messed around some. She started right up, but then about 10 miles further along she just quit cold again."

"How did the engine act?" put in Gus as he eyed the instruments on the dash.

Not Enough Gas?

"Acted like she wasn't gettin' gas," said Ed thoughtfully. "And that's what the man at the next garage thought, too. He put in a new fuel pump."

"Did that help any?" asked Gus.

"She started up without a fuss, just like before, but she didn't purr for long after I got back out on the road. That time I decided I'd go to one of the big service stations in town."

Gus was trying his best to listen to Ed with one ear and to the engine with the other. "How'd you manage to coax her that far?"

"'Bout that time," Ed said, "I discovered she'd start up again if I just let 'er set awhile. Puzzlin', ain't it?"

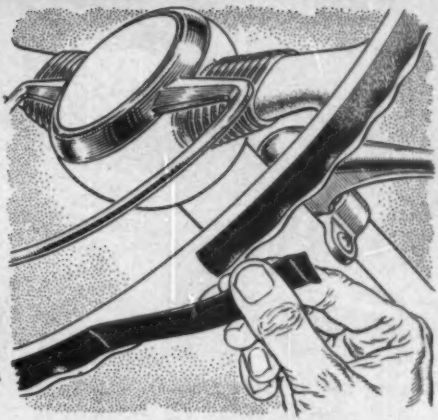
Gus agreed with a nod.

"The fellows in town gave 'er the works. Said they'd cleaned the air filter, put in a new condenser, checked the carburetor and replaced the gas-tank cap. Claimed the old one had a plugged vent."

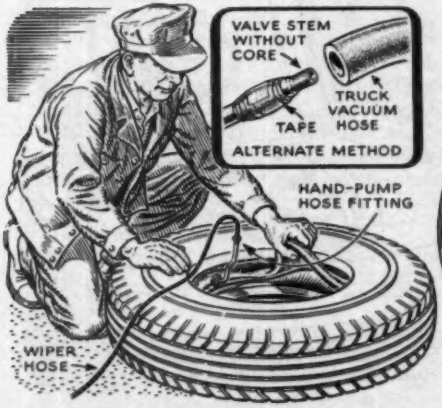
[Continued on page 264]

Hints from the Model Garage

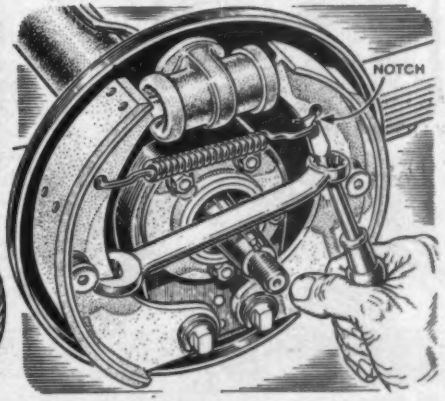
How to Free Stuck Lock Button. The button that locks a door from the inside often tends to stick, either because of corrosion or slight misalignment of the lock and window casing. To fix, unscrew the button and file lightly around its bottom edge.



Tape Stops Wheel-Cover Slide. A steering-wheel cover that slips can be anchored by sticking friction tape around the edge of the wheel and replacing the cover. The tape's outer surface is tacky enough to keep the cover from sliding.



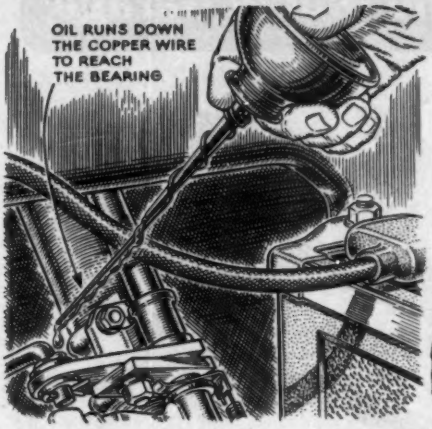
Vacuum Frees Heavy Truck Tube. To suck the tube loose from a heavy truck tire, mechanics at McElroy's Garage in Enon Valley, Pa., wrap tape around the uncored valve stem, press on the hose from the truck's vacuum brakes and run the engine. You could also hook up the wiper hose with a hand-pump hose fitting.



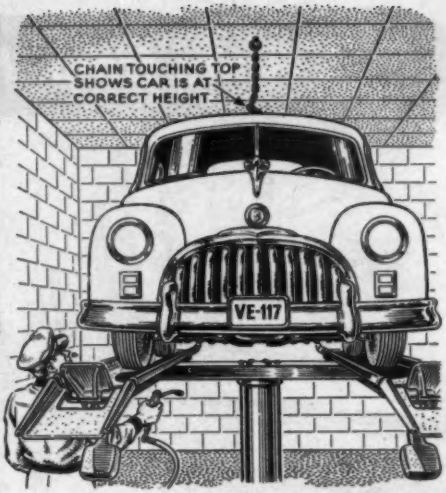
Replacing a Brake Spring. If you have trouble replacing the return spring on hydraulic brakes, try this: File a notch near the tip of an old screwdriver. Choose a combination box and open-end wrench that spans the shoes. Hook the open end over one shoe, put screwdriver through box and pry spring in place.

Turn the page, please, for four more auto hints.

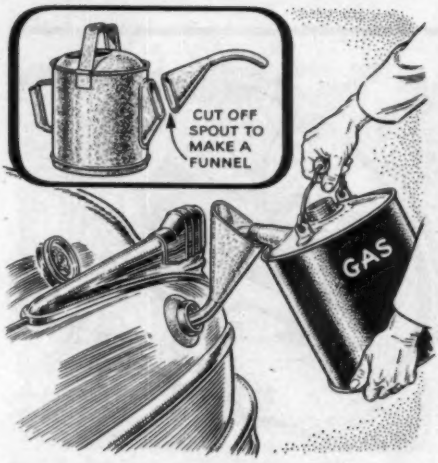
MORE Hints from the Model Garage



Putting Oil in Tight Spots. Those hard-to-reach spots on a car can be oiled by winding some copper wire around the oil-can spout. When a drop of oil comes from the spout, it flows along the wire to the desired spot instead of falling free.



Chain Guides Lift Height. One mechanic reports that his hydraulic-lift controls are located where it's hard to judge correct car height. He fastened a chain to the ceiling. When chain touches, he stops the lift. With tall cars, he lets the chain fall over a bit.



Funnel Reaches Fuel Tank. Shops that get calls to rescue gas-stranded motorists will find this funnel a useful accessory to carry along. The bent spout makes it much easier to pour gasoline into tanks with side inlets. On the cars where the filler cap is deeply recessed in a fender compartment, it eliminates wasteful, sloppy pouring.

Oil Frees Hood Latch. After a few years, a hood latch operated by a cable running to the instrument panel sometimes sticks. You can free it by applying a light machine oil or an oil-and-kerosene mixture to the full length of the cable. The oil will penetrate the sheath. Such care may also help prevent breaks, which are hard to fix.

Man's Lamp Made from a Stirrup

Here's a handsome accessory to give lift to the imagination.

SOME modern lamps make the male eye wince. But this one, handsome in leather, brass and mahogany, will be welcome in any man's den or ranch-style home.

It's built around an ordinary wooden stirrup you can buy at saddlery shops or scrounge around a farm. After the stirrup is wired, you can have a saddlemaker cover it with leather, or do so yourself.

The standard. Unbolt the iron spacer from the stirrup and cut a new one from brass or copper pipe the same size. Saw or file a ⅜″ hole midway in it and insert the standard, a piece of ⅜″ copper or brass tubing threaded for a socket.

For maximum strength, the joint should be brazed or hard-soldered. If you must use soft solder, build up a tee, using a brass or copper sleeve rolled around the spacer, and a collar filed to fit the sleeve. Tin all joining surfaces and sweat-solder over a flame. Drive screws add solidity.

The wiring. Drill a ⅜″ hole in the bottom of the stirrup for a mounting bolt. Also drill a 3/16″ hole from one edge into the spacer-bolt hole, notching the latter to get the wire past the bolt. Groove the drilled edge of the stirrup down to the bottom for the wire. Feed the cord through the standard and glue it into the groove. Clamp the new spacer with the original bolt.

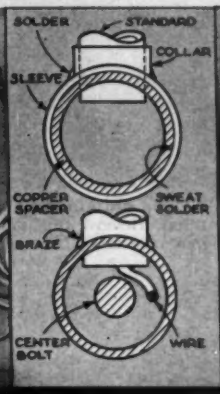
The base. Rip ¾″ mahogany 1¾″ wide and cut to the lengths indicated in the photo, with the ends at 45°. Clamp, then run a D drill through at 1½″ intervals.

Cut two pieces each of ¼″ brazing rod 12¾″, 10″, 7″ and 4″ long. Polish and push them through the holes, spacing the strips ¾″ apart. File the rod ends flush. Drill the center strip for a ⅜″ bolt and the cord.

Finish the base with clear lacquer. Add rubber feet and bolt on the stirrup. Mount the socket and a lamp harp to hold the shade.—*Roland Cueva, Los Angeles.*

Groove the edge of the stirrup along one side. Drill in at the bottom of the groove and up from underneath to make a hole for the cord to run out under the stirrup.

Brazing rods pushed through snug holes in the base strips require no fastening. Western fans may prefer a base jigsawed from 1″ wood to the shape of a real ranch brand.



1. **This old patch** has started to bulge and crumble. Only solution is to knock out loose, cracked or crumbling mortar, and replace it.

How to Repair Stucco

Tackle the small cracks soon and you'll prevent big troubles. Even large patches are a simple handyman job.

By Bernard Gladstone

PATCHING a stucco wall is not nearly as difficult as it looks. Compared to some home-maintenance jobs—like paperhanging or refinishing old furniture—fixing cracked or loose stucco is easy.

Stucco should be repaired at the first sign of damage, since even small cracks can cause trouble. Water seeps into a crack and gets behind the stucco. Eventually the lath rusts and the area begins to bulge. Then chunks of mortar drop off. That's what happened to the old patch shown here.

2. **If lath has rusted** from water seepage, it must be removed and replaced. A ripping bar is handy for this part of the job.

3. **The old building paper** may have deteriorated. Remove this paper and any furring strips that may have been nailed over it.

Tools you'll need. A cold chisel or stone chisel, a trowel, a wooden float for surfacing the mortar and a hoe to mix it will get you started. To carry mortar to the job, a hawk—shown in photo 11—is handy.

Here are the steps for a patch repair: Tear out the old, crumbling mortar. If the old lath is rusted, take it off. Nail on new building paper and new lath. Then put on two coats of mortar. Follow this with the stucco coat, a slightly different mix from the mortar coats.

Mixing mortar. Many building-supply dealers and hardware stores sell ready-mixed sand and cement. All you have to do is add enough water to make an easily workable mortar. If you want to make your own, mix one part of Portland cement with three parts of clean, coarse sand, and add water. This mixture is used for the first and second coats.

Curing. For best results, the intermediate and stucco coats should be kept damp for about two days each. Use your garden hose with the nozzle set for a fine mist. Start dampening the mortar as soon as it has set enough not to be damaged by the spray. After the two-day curing period, let the second coat dry completely before putting on the stucco.

Stucco coat. You can buy factory-mixed stucco that is already colored, or you can mix your own and add the color.

For this finish-coat mortar, mix 1 part cement, 1 part lime and 4 parts sand. Mix these thoroughly while dry and then add water. Use limeproof dry colors (paint stores sell them) mixed with water to make a paste. Mix the paste with the mortar.

An exact match between the color of a patch and the old stucco is almost impossible. But with care you can come so close that the patch will hardly be noticeable.

Types of textures. The finish coat shown in the photos is called spatter dash. You dip a whisk broom or brush in the mortar and dash it on the surface. Fineness of the finish can be controlled by varying the distance between the whisk broom and wall. For a rougher finish, use fine gravel instead of sand in the dash coat.

There are a great many other textures. Here are a few of the more popular ones and how to duplicate them:

Italian texture is a spatter-dash finish with flat troweled spots in it. Put on the dash coat and let it set partially. Then slide your trowel across the coat, leaving scattered flat areas.

Spanish texture has wavy trowel marks at various angles. Slap the mortar on in big globs. Put some on horizontally, some vertically and some at other angles. Let it set partially and use your trowel to smooth out most of the rough edges.

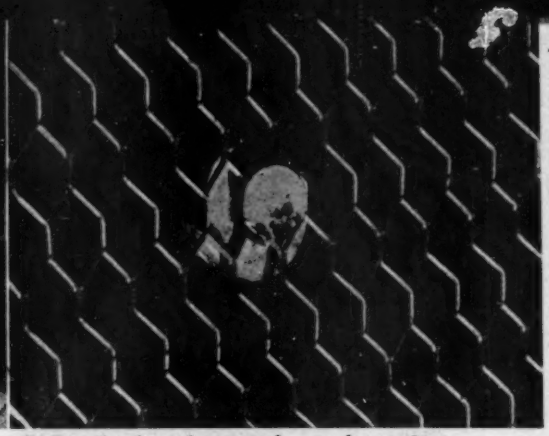
English-cottage texture is produced much like Spanish texture. But instead of slapping on full trowel loads, apply smaller amounts. Put it on with short, twisting strokes. Don't go over it with the trowel.

[See next three pages for more photos]

4. Nailing building paper to siding is first step in applying a new patch. Use large-headed galvanized nails spaced 12" to 15" apart.

5. Wire lath goes on over the building paper. Use rustproof diamond-mesh lath. Cut piece to exact size so it fits snugly in patch area.

6. Don't nail lath flat against wall. If you have no furring nails, brad galvanized washers (above) to wall as furring points.



7. Detail of washers is shown above. Use stacks of three washers. Brad these groups of washers to the wall at 7" or 8" intervals.

10. Soak old stucco thoroughly along edges of patch area before troweling on mortar. An old paintbrush is handy for applying water.

11. To carry mortar from the mixing pan to the job, you'll need a hawk. A 10" square of plywood with a broomstick handle will do.

14. Cross-scratch the surface before it hardens, using a scrap of wire mesh. This operation gives the scratch coat its name.

15. Wet down scratch coat thoroughly after it has dried and hardened for two days. Then put on second coat—sometimes called "brown" coat.

8. Fasten mesh over washers with large-headed galvanized nails. The brads through centers of washers leave enough room for nails.

9. Ready-mixed cement and sand—sold at building-supply yards—is your best bet for small jobs. Metal wheelbarrow is good mixing pan.

12. Start troweling on mortar at the bottom and work up. Press the mortar firmly through mesh until lath is completely embedded.

13. First coat should be about ⅜" thick. Work it well into corners and along edges. The first coat is called the scratch coat.

16. Press mortar of second coat firmly against scratch coat to secure a good bond. Build it up to within ¼" of surrounding wall surface.

17. When second coat stiffens, go over the surface with a wooden float. Work with a circular motion.

[*Continued on next page*]

18. To match spatter-dash finish of this house, enough water and lime were added to the cement-sand mix to bring it to a creamy consistency.

19. Cover hardened second coat with thinly spread mortar. While it is still wet, spatter on the stucco coat with a whisk broom.

20. Finished patch, when dry, closely resembles old stucco surrounding it. When working near window or door frames, mask them.

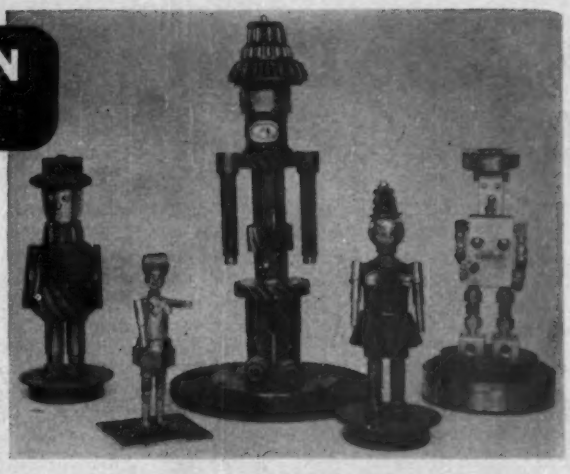
Repairing a Crack in a Stucco Wall

Undercut the sides of the crack so the crack is wider at the bottom than at the top. Use a hammer and a stone or cold chisel.

Scrape out loose or crumbling old mortar and dust out the crack with a dry brush. Before applying mortar, wet the crack with water.

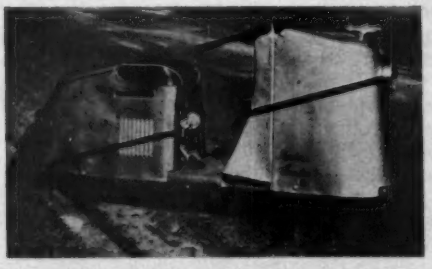
Fill crack, packing mortar in tightly with a small trowel. Deep cracks that expose lath should be filled with two coats of mortar.

CRAFTSMEN AT WORK

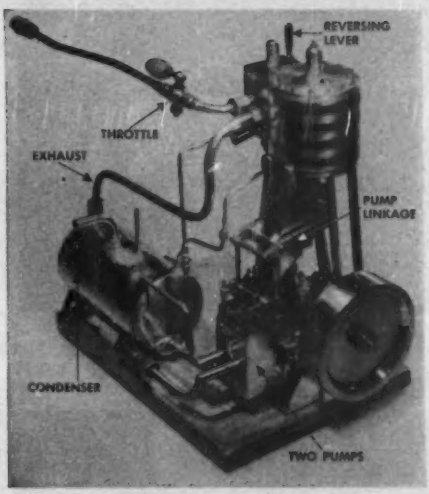


Scrap-Metal Art. For ten years, Dr. Bernard H. Cooper, a Cleveland dentist, has been a scrap-metal sculptor. The group of figures at right, made of gears, bolts and nuts, won a special award at a Cleveland Museum of Art show. Dr. Cooper used to work in copper but turned to scrap during the war when copper became scarce.

Goat Pulls Kids. This farm chariot for youngsters, built by C. A. Cole, of Graham, Ala., peaks at one goatpower. Two 20" bike wheels support the play cart, being mounted to the side of the box body by individual strap-iron yokes.



Hood Streamlines Scooter. Earl Heglund, of West Palm Beach, Fla., dressed up his motor scooter by building a sheet-metal hood forward of the steering handles. The hood adds extra luggage space and can easily be removed to grease the front end. Heglund says that the streamlined front seems to improve the scooter's performance.



Engine Has Condenser. Like a real marine engine, this single-cylinder model steam engine exhausts into a condenser at less than atmospheric pressure. Built without castings by Armando Bolletig, of New York City, the engine has a bore of 1 3/16" and a 1¼" stroke. The cylinder is white metal with a bronze liner. Two pumps are driven from the crosshead, one to circulate cooling water through the condenser and the other to pump feed water back into the boiler. At 75-lb. steam pressure, shaft speed is approximately 1,750 r.p.m. Two eccentrics and full reverse linkage enable the steam cutoff to be altered to suit varying load conditions.

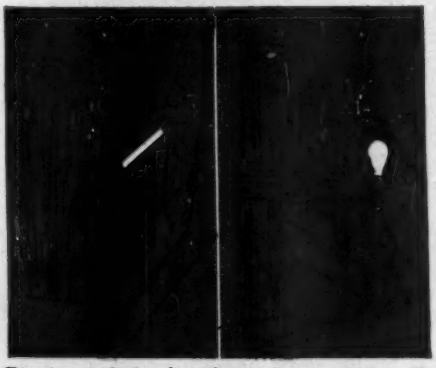
How to Light a Room for Television

Badly placed lights, or not enough, can strain your viewing fun—and your eyes.

TELEVISION lighting isn't entirely up to the technicians in the studio. You, the viewer, can increase your enjoyment of the show if you light your TV theater right.

The first thing most people did when they turned on their brand-new sets was to turn off the room lights. After all, don't you watch movies in the dark? This, say the experts, couldn't be more wrong. Movie theaters are dark to balance their very large, very dim screens. TV screens are small and surprisingly bright. To avoid discomfort—and possible eyestrain—they should be balanced with fairly bright lighting.

Most annoying lighting trouble is reflection of bright lamps in the viewing screen. An easy test for this is to turn on the lamps and move a hand mirror around on the safety glass.



Rigging a light directly to the set is a good way of illuminating the important background area. If set rests flat against wall, use 8-watt fluorescent or 30-watt Lumiline type of incandescent. Ordinary round incandescent (25 or 40 watts) can be used if set is in a corner.

The expert's formula is a very even, reasonably high level of illumination throughout the room. The wall behind the set should be especially carefully lit—smoothly, quite brightly, but with no areas much brighter than the screen itself. This lets your eyes move around without encountering sharp contrasts, which are very annoying. Ideally, none of this light should fall directly on the TV screen. But most important, no bright spots—lampshades or lighted bulbs—should be reflected back to your eyes by the screen.

Here are some tips for your TV room:

Don't use ceiling lights except totally indirect ones or the modern, flush types that project light straight down. Ordinary ceiling fixtures may cause bad reflections.

Do use floor and table lamps. Indirect floor lamps, set at low or medium brightness, work very well. If translucent lampshades are reflected in the TV screen, you might replace them with opaque shades. If the bright inside rim of a lampshade is picked up by the screen, try covering the rim with a band of dark material.

Don't put lamps near the set so you see them when looking at the screen. Even though the light may not disturb your eyes, the bright area will tend to distract your attention from the picture.

Experiment with a small light fastened to the back of the set itself. This is a very effective way of lighting the viewing wall, for the cabinet hides the bulb and the bright area immediately around it.

Check for reflected bright spots in the TV screen. One quick way is to hold a small hand mirror against the safety glass and move it around. If reflections show up, you may be able to eliminate them simply by moving something—the lamp, the set, or the chair you normally watch from.

WRONG This looks like fun, but is almost sure to lead to eye fatigue. The junior cowpokes are too close to the screen in a room that is much too dark. Bright screen surrounded by darkness "locks" eyes, tiring them. Areas near set should be bright, so that the children's eyes can move around without making adjustments to sharp changes in illumination.

RIGHT The room is now correctly lit for comfortable viewing—and safe walking. High light level will not wash out picture on modern "black" tubes. Notice placement of floor lamp. It is out of children's view, does not spill direct light on screen and is not reflected in the screen. Another light fastened to back of set helps illuminate background walls. END

Tape Tab Improves Negative Carrier

APPLY a tape handle to one end of the top glass of your enlarger's negative carrier. The tab will make the glass easier to remove and replace, and cut down fingerprints.

Storage Hints for Small Sailboats

UNSTEPPED masts should be supported at several points during storage to avoid warping. Standing rigging of small boats requires little attention. Galvanized turnbuckles should be opened and greased. Centerboards used in salt water should be given a coat of copper paint. The inside of the trunk also should be painted.

My Most Ingenious Solution

My garage was too narrow. When I drove my car in, I couldn't get out of the car because there wasn't enough room for the car door to swing open. I was stuck until I thought of this remedy.

I built a door into the side of the garage. Now I drive in, reach out and open the side door, open the car door into the side door, get out, close the car door, and then shut the side door.—Howard Walton, Knoxville, Tenn.

Colonial Chair Comes Knocked Down

EVEN if you don't have the tools needed to make fine furniture, you can put together this handsome ladder-back chair. It duplicates a Colonial original now in the Boston Museum of Fine Arts. Precision-cut, ready-to-assemble parts, including fiber rush for the seat, are sold by Hagerty, Cohasset, Mass., for $9.95. The firm also supplies other Colonial pieces in kit form.

Cloth Hinges for Models

THE stiffened gauze backing of adhesive bandages, foot plasters and the like makes excellent hinges for moving parts on model planes. The gauze is easier to apply than ordinary cloth because it is stiff and flat and can readily be slipped into slits cut in the control surfaces.—*Edward T. Robinson, Dayton, Ohio.*

Feed Scoop Cut from Old Saucepan

SCOOPS for handling chicken feed on the farm, or sugar or flour in the kitchen can be made from discarded aluminum pans. Depending on the gauge of the metal, use a hacksaw or tin snips to form the scoop.—*George Kapitan, N.Y.C.*

Building a Cold-Light Enlarger

Prints of real professional quality are yours with this unit. It uses your camera as its optical system, and is a simple hand-tool job.

By Harry Walton

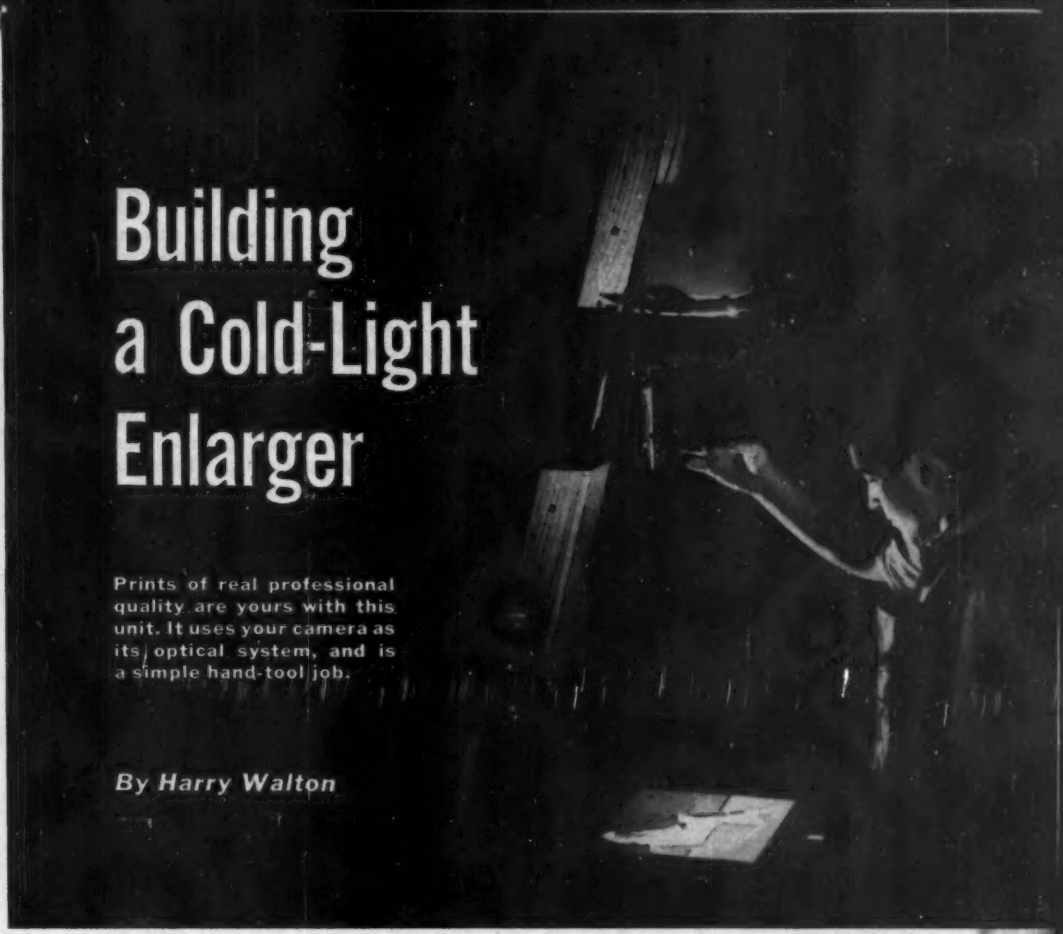


Photo by Orlando Guerra

COLD light is the hottest enlarger development in years. Instead of a sizzling incandescent lamp that bakes your negatives, you light them with something like a zigzag neon sign, which hardly gets warm.

Exposures are short, prints are sharp, defects are minimized—and you and your negatives stay cool. Until you've built yourself an enlarger with a cold-light unit, you won't really know how good a homemade one can be.

How good is this one? The PS cold-light enlarger leaves diffuser and condenser jobs far back in their own dust. It makes prints a professional photographer would be glad to sign. Besides the cold light, it has a counterbalanced head, a velvet-smooth lock and handy negative-masking slides. Yet

How high a column do you need? To find out, tape a sharp, thin negative to the opal glass of the cold-light unit and fasten it in front of the grid with tape. Set your camera in front, shutter open, in a dark room. Measure from negative to easel when setup is focused for the biggest image you require. The 6" lens of this camera enlarges five diameters on a column 48" high. Negative 1¾" from camera can be focused down to normal size with extension bellows.

it is easily built with ordinary hand tools.

A cold-light unit that will cover negatives up to 2¼" by 3¼" costs about $21 at large photo-supply houses. The 4" by 5" Aristo Cold Gridlite shown costs about $32. It houses in a single compact metal case the cold-cathode grid, a high-voltage transformer, and an on-off switch. Installation is a breeze—you simply set the boxlike unit into a collar screwed fast to the enlarger head.

All the other materials come to eight or nine dollars, and if you have a well-stocked scrap box you can shave that figure.

Why use cold light? First of all, it eliminates the tough chore of building a lamp house. You have no jigsaw puzzle of vents and baffles to put together, no awkward, tall chimney to hit the joists of your cellar darkroom.

With cold light, negatives emerge cool and unrumpled, no matter how long they're exposed. Exposures are as short as with a condenser enlarger. The cold light (3,500° Kelvin) is strong in the blue-violet region of the spectrum to which enlarging papers are most sensitive.

Illumination is even all over the image; there is no "hot spot." The lamps are said to be good for 10,000 hours of use. Therefore, barring breakage, you buy for keeps. They switch on and off instantly, without delay or flickering.

Perhaps most important of all, you get better print quality, with a full range of contrast, transparent darks that reveal detail, and excellent texture. Cold light minimizes grain, scratches and retouching, whereas a condenser system emphasizes them. And cold light works fine with variable-contrast paper and color materials.

What's in an enlarger? Basically, it is just a magic lantern—the kind that projects glass slides on the wall. It has to have a light source to illuminate the negative and a

Wooden column is built of two ¾" by 2¾" hardwood sidepieces glued and screwed to a ¾" by 4½" web member. Short web shown was later pieced out to provide a full-length track for the counterweight.

Anchor plate of ¾" plywood is glued and screwed across bottom end of the column. End cuts of sidepieces must be carefully made to identical angle, here 75°. Screws through the baseboard run into both anchor and column.

Head consists of two L-shaped sidepieces outside the column, joined by crosspieces both back and front. Those in front are glued, but rear ones are attached with screws only. Put cardboard shims under the rear crosspieces if the head does not slide freely.

Camera mount is ½"plywood, with the negative area cut out. Mending plates are spaced off by thin wooden shims to duplicate the flanges on the ground-glass back fitting the camera. A stop hooks against inside camera edge to prevent it from slipping back off the flange.

lens to throw an enlarged image of the negative onto a flat surface (called the easel). Printing paper laid on that surface is exposed to the image.

The lamp, negative holder and lens system must be easy to move nearer or farther from the easel to make enlargements of different sizes. For greatest convenience, they are usually arranged to slide on a vertical column, above a horizontal easel.

Use your camera. An anastigmat lens will do as good a job of enlarging a picture as of taking it, so it's logical to use your camera as the optical system of your enlarger. A camera with a helical focusing mount may not have enough lens travel, or the lens tube may block off part of the field. But almost any bellows-type camera will do. All you need is a mounting board with clips or other fittings to hold it the proper distance from the negative.

Your enlarger will therefore be planned with the camera in mind. The focal length of its lens roughly determines the size of the negatives the enlarger will handle. You can't blow up 4-by-5s with a 35-mm. lens; it won't cover the area. And though you could enlarge 35-mm. negatives with the lens in a plate camera, you'd need an abnormally high enlarger column and would wind up with long exposures.

The lens will readily blow up negatives ranging from about half the size of those it takes to just a trifle larger. If you shoot on both 35-mm. and cut film, better make a mounting board for each of your cameras and enlarge with the appropriate one.

What you buy. Cold-light units are available for many commercial enlargers, and also in certain standard sizes. Buy one the size of the biggest negative you plan to work with; it will serve for smaller negatives as well.

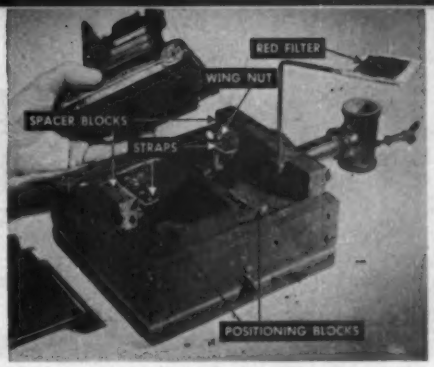
Other parts required are ¾″ hardwood, ¾″ plywood, a little ⅜″ or ½″ plywood, two small pulleys, and such miscellany as angle brackets, mending plates, screws, cord, glass, and tin plate.

Your test setup. You could calculate enlarger dimensions, but it's just as easy—and more fun—to make a trial setup of the cold light and camera as shown in the photo on page 197.

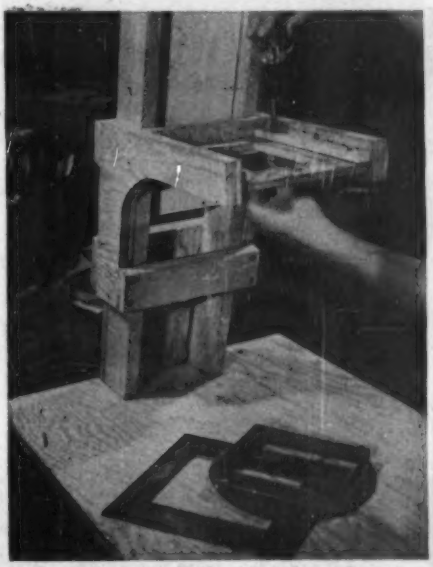
Put two pinpricks 1″ apart on your test negative. Measuring the distance between these in the image will tell you how many diameters of enlargement you're getting. Remember that five diameters gives you a 20″ by 25″ image from a 4″ by 5″ negative. With miniature films, of course, you may want to go to 10 or 12 diameters.

Focus an image the maximum size you want the enlarger to project. Then measure the distance from the negative to the image. Your enlarger column will have to be about 2″ longer.

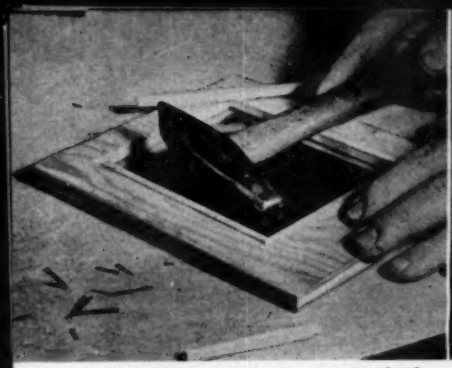
Figuring negative spacing. How small an image do you want to be able to project? For lantern slides, or black-and-white neg-



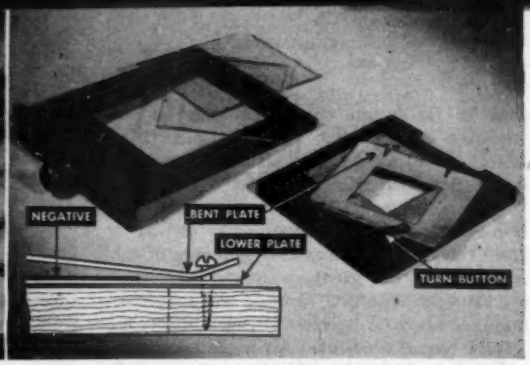
Simpler mount, shown here for a roll-film camera, consists of blocks nailed to the board around the camera. Metal straps held by wing nuts on long bolts clamp camera fast. Filter mount pivots in angle bracket and hole in board. Column for this head is 1″ pipe. Tee, shown here was bored out to slide on it freely.



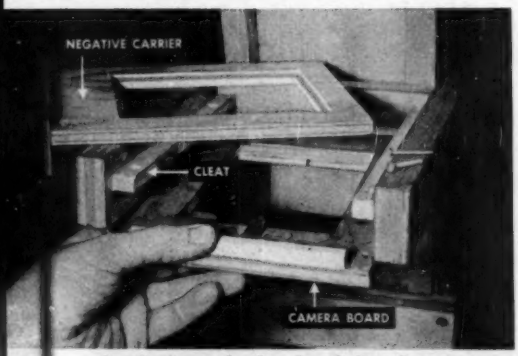
Camera board is held with bolts and nuts so that it may be changed for other cameras. On easel are collar for cold-light unit and ¾″-thick panel for top of enlarger head.



Negative carrier is a piece of plywood with a rectangle cut out slightly larger than your film size. Place it on a flat surface, put two pieces of glass in the opening, and nail in wooden strips over the glass. To use, turn it over with glass on top.



Wood strip on front of carrier blocks light leakage. Stick tape on corner of top glass for lifting it. At right above is a glassless negative carrier. Two pieces of sheet metal have film openings cut in them. Wood screws, not fully driven, go through lower one. Upper one is notched to slip under screw heads, held against tension of its bent edge by turn buttons.



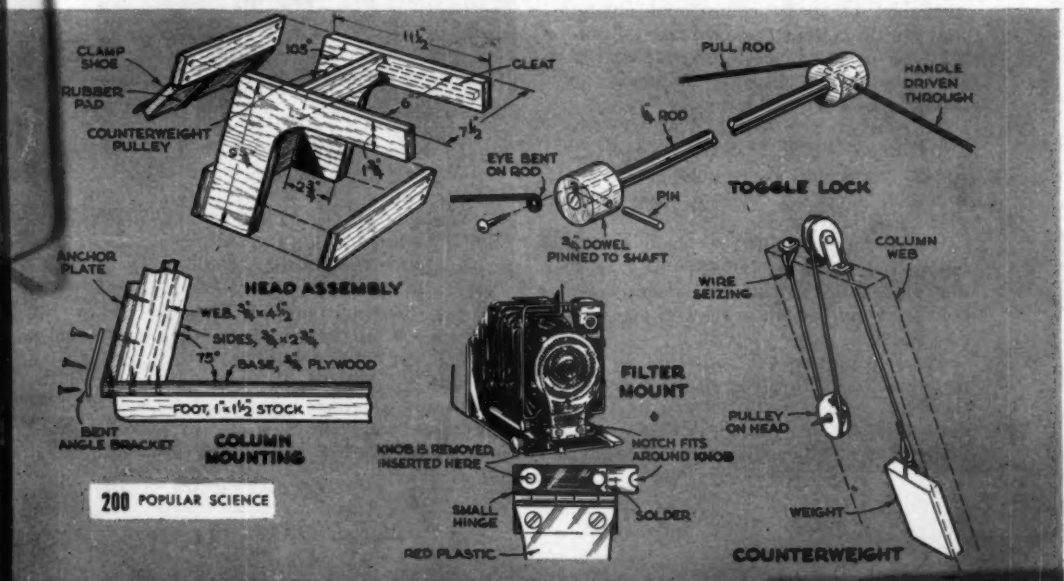
Small cleats glued and nailed to the sidepieces support camera board and negative carrier. Clamp head against front of column. Then align cleats parallel to the baseboard by measuring down to it from both ends of each cleat.

atives from color transparencies, you may want one negative size or even smaller.

This requires the lens to be nearer the easel than it is to the negative, an adjustment hard to obtain unless your camera has double- or triple-extension bellows. It helps to space your negative holder an inch or two above the camera. The test setup will show what spacing between negative and camera is practicable with your bellows.

The negative should be directly under the light grid for best results, so space the head cleats to bring the carrier glass almost flush with the top of the head.

Construction pointers. Well seasoned flooring or other hardwood should be used for the column. If you have no circular saw, have the lumberyard rip the three pieces for you to be sure they will have parallel edges.



From there on everything can be done with hand tools.

The column shown in the photos slants forward at 75°, an angle that gives ample margin between the bottom of the column and the image at full enlargement. For a short-focus lens, the slope may have to be steeper. Your test setup will show this.

Fitting the head. Having built the column, clamp the L-shaped sidepieces of the enlarger head against it with thin cardboard shims between. Then fit the front and back crosspieces. Sand sliding surfaces velvet smooth. If the head sticks at one or two spots on the column, sandpaper those. A close fit across the width of the column is desirable, but plenty of freedom can be left front and back if the lock shown is used. This draws the head against the front column edges whenever it is locked.

Either attach the head lock first or clamp the head firmly against the front of the column before installing the cleats that support the camera board and negative carrier. These must be parallel to the easel.

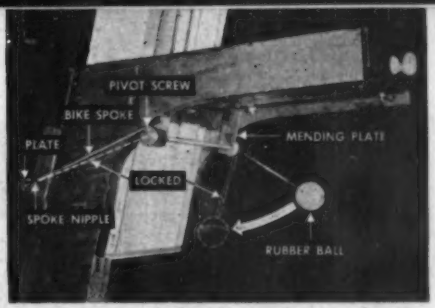
You can improvise fittings on the camera board to engage the catches on the camera. A simpler mounting can be made by nailing cleats or blocks on the board to position the camera, with turn buttons or swiveling straps to clamp it fast. Paint the interior of the head, and the negative carrier, dull black. A camera lacquer is available for this.

A ⅛″ composition-board panel with a 4″ by 5″ hole covers the head. The light mounting collar rests on this, with the masking slides sandwiched between. Back off the screws a bit to leave the slides movable.

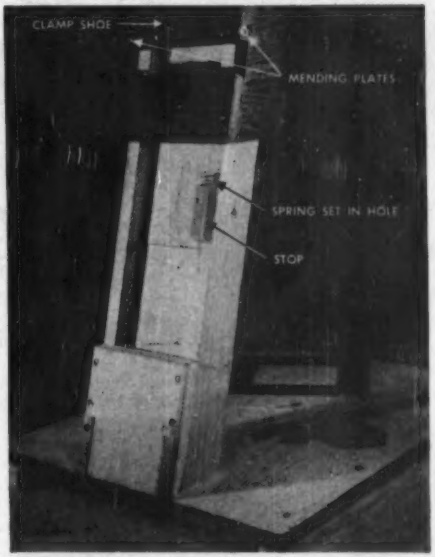
With a long bellows draw, the paper placement filter should be mounted on the lens bracket. The drawing shows how a piece of red plastic can be bolted to a small hinge, which in turn is mounted under one of the draw-out knobs on the camera.

The counterbalance. A spring-type sash balance (available at builder's-supply stores) can be mounted on the column to counterbalance the head. The loop at the end of the steel tape need only be slipped over a bolt driven into the head. In the enlarger shown, the head is balanced by a counterweight sliding along the back of the column. A pulley on the head and another at the top of the column afford a 1-to-2 reduction, so that the weight need only be half as heavy as the head. END

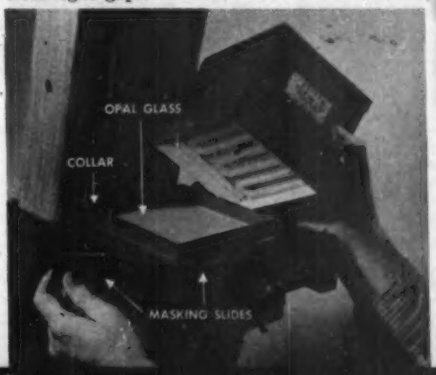
A power lawn-mower engine can be used to clean snow off walks. See PS next month.



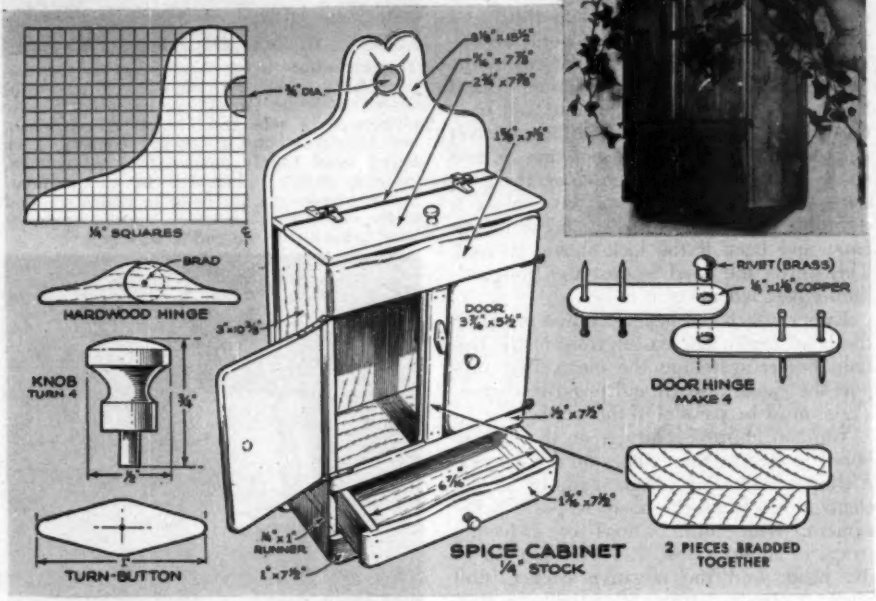
Toggle action locks clamp shoe as the two pivot screws (one on each side) go past dead center. Rods are bicycle spokes, adjustable by nipples at the shoe end. Hinged shoe has rubber facings where it touches column. Lock draws head tightly against front of column, insuring parallel alignment in all positions. Spoke nipples engage holes in plates screwed to the clamp shoe (below). A spring stops the head smoothly at the end of its travel.



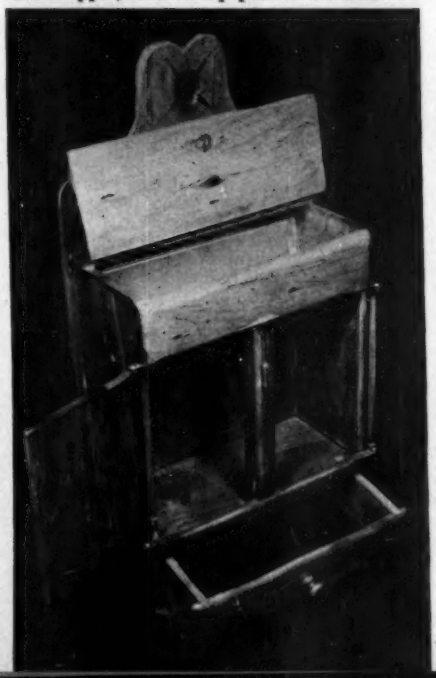
Cold-light unit slips into its mounting collar, which is drilled at three points for screws that hold it to head. Rear and side masking slides are slotted for these screws. Side ones go under ⅛″ panel on which collar rests. Front and back slides go under collar. Shims at panel corners close light gaps.



How to Make an "Antique" Spice Box



Watertight plant tray, soldered together from sheet copper, rests in top part of the box.



IN THE old days, almost every kitchen had a spice box, for spices were a cherished cooking aid. Today these old boxes help decorate the living-room wall or serve as a place to put keys, stamps and oddments that otherwise collect on a hall table.

This box is new—but it looks old. The appearance of age was produced by using a piece of old pine planed down to ¼", by rounding off edges to suggest long wear, and by pocking the wood with the worm holes characteristic of old lumber. The wormy effect can be made with an awl or with a small burr in an electric drill.

Wedge-shaped hinges for the upper compartment were carved from black walnut. Before starting a hinge carving, a small brad should be driven through two pieces for a hinge pin. Small roundhead screws, with most of their shanks cut off, can substitute for rivets in the copper door hinges.

Use several thin coats of shellac, well rubbed down, for a finish on the box. Then wax.—*John P. Arnold, Doylestown, Pa.*

A record flowerpot makes an unusual home for a small plant. A 10-inch disk will make a 4-inch flowerpot.

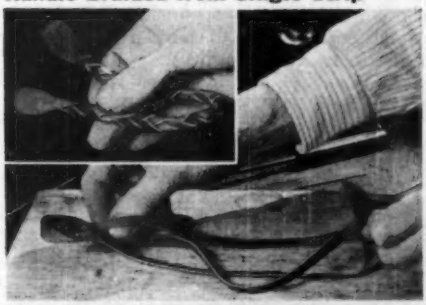
You can add color to the "pot" by painting stripes on it this way. Hold dipped brush against record as it spins.

Center disk on a flowerpot and place in heated oven. When record softens, shape its edges by hand.

Phonograph Records Go to Pot

WHEN a phonograph record gets too scratchy or out-of-date to listen to, it may still give you something to look at. You can heat-mold it into an unusual flowerpot. In the finished pot, the platter's center hole becomes a drain hole. *—Paul Haller, St. Paul, Minn.*

Handle Braided from Single Strip



YOU can make a good-looking braided handle or drawer pull from a single strip of leather by cutting two slits in it while leaving the ends uncut.

Select a strip of leather a bit longer than you wish the finished work to be. The sides should be parallel. Divide the strip into three equal parts by making two parallel cuts to within an inch of each end. Beginning at one end, braid the strips. You'll find that one end will twist during the braiding process, but it can be straightened out again by passing it through the proper slit. The braided strip will alternate, first with the right side of the leather showing, then the wrong. The last few braids are the hardest because there's no spare material.—*W. E. Burton, Akron.*

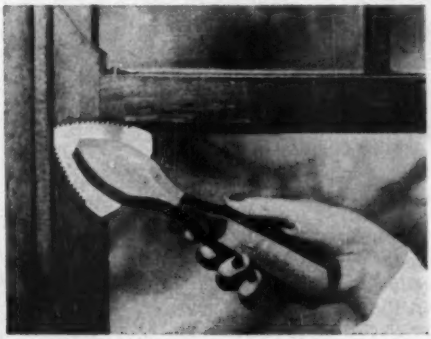
Refrigeration Adds to Battery Life

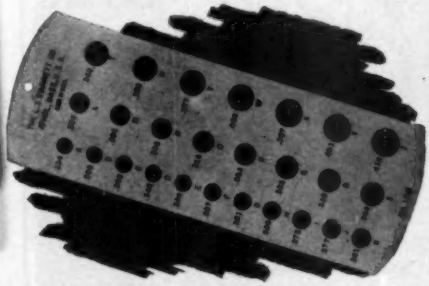
DRY-CELL flashlight batteries will last longer if stored in a refrigerator. It's a good idea to put them in a container that is not tightly sealed. A battery should not be used immediately after removal from refrigerated storage but should be allowed to "thaw out" in order to give maximum power.

They're steel workers. A salamander is the mass of solidified iron that gradually builds up in the bottom of a blast furnace. Shooting the salamander means getting rid of it by boring a hole through both furnace bottom and salamander, liquefying the salamander, and tapping it off through the hole.

Tool Sharpener. End mills, countersinks, spot facers, reamers and similar tools—including carbide-tipped ones—can be quickly and accurately dressed with this setup. Adjustable feed, plus six- and eight-point indexing stops, provide control of tools being sharpened. Three adapters for tool shanks of different diameters are included. The fixture also can be used to sharpen saws. *Treyco Products, Kenmore, N. Y.*

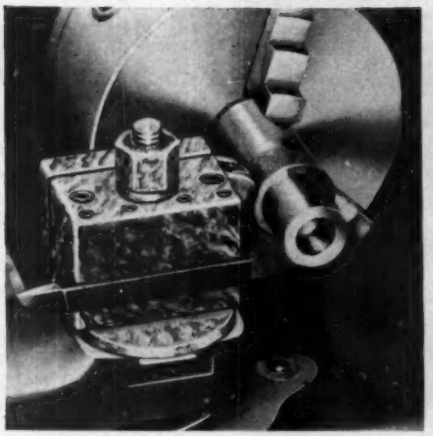
Frees Stuck Windows. Only slight pressure on the tool shown at right is needed to cut away paint that holds a window fast. The saw-toothed blade is inserted between the sash and frame and the blade worked up and down. The tool is also said to free warped windows. *Rene-Craft Products, Wilmette, Ill. 98 cents.*



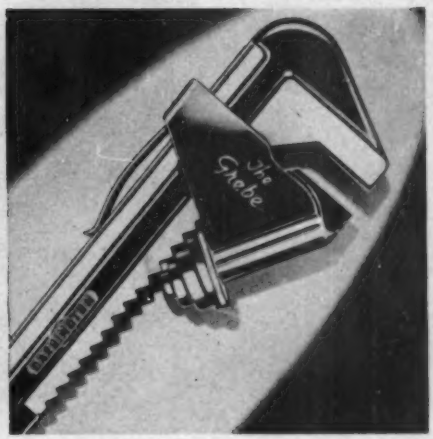


Drill Gauge. The 26 gauging holes in this plate (above) for the letter-series group of drills also show decimal equivalents from .234″ through .413″. The 2 5/16″ by 6¼″ gauge is hardened and ground. *L. S. Starrett Co., Athol, Mass.*

Gun Oil Sprayed on. The oil in the pressurized spray container at left is said to displace any moisture or dampness on metal. The spray also makes it easier to get oil into assembled gun and fishing-reel mechanisms. The oil also dissolves burnt powder in guns. *Mitchell-Bradford Chemical Co., Stratford, Conn.*

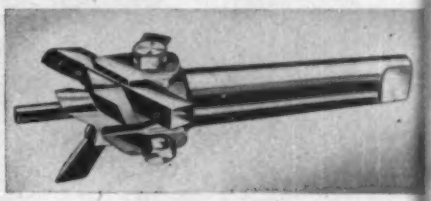


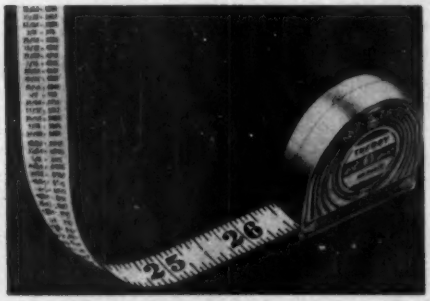
Multi-Purpose Tool Holder. A feature of this holder is screw adjustment for tool height. Once set, tools of the same type can be changed without disturbing the height adjustment. Operations it will handle include knurling (above), boring, cutting off, turning, facing and threading. It comes in five sizes for South Bend lathes and can be adapted to some other makes. *South Bend Lathe Works, South Bend, Ind.*



Wrench Adjusted with One Hand. Hook this wrench on a nut, slide up the free jaw, and you can quickly adjust it to fit with one hand. Pulling the knurl away from the teeth frees the jaw for sliding. When the knurl is released, the spring on the back of the wrench forces the knurl to re-engage the teeth. The knurl is turned only for fine adjustments. *John Garrington & Sons Ltd., Bromsgrove, England.*

Hole Cutter. The replaceable bits in this tool (right) are easy to sharpen and set. Made of high-speed steel, they are set 120° apart. The body is heat-treated steel. The pilot is removable so that a lead drill can be used. Sizes run from ⅝" to 5" and thickness capacities from thin sheets to 1". *Robert H. Clark Co., Beverly Hills, Calif.*





Steel Tape Has Decimals on Back. A decimal-equivalent chart, giving the conversions of 64 fractions to decimals, is engraved on the back of this steel tape. *Master Rule Mfg. Co., Inc., Middletown, N. Y.*

Three-In-One Drill. In one operation, this drill (right) cuts pilot hole for a screw, shank clearance and countersink. For boat builders and others who plug their fastenings, another model counterbores, countersinks and drills a pilot hole. With these drills, you can't drill the pilot hole too deep or too shallow because the shoulder stops the drill. *D. R. Carner Co., Inc., Providence.*

How

By
Robert
Hertzberg

to Take Dog Photos

It helps if a cameraman knows more tricks than the dog. Here's how a successful pet photographer does it.

EVER shoot a picture of the spot your dog occupied just a second before? Or a blurry glimpse of his hindquarters rapidly going elsewhere?

Such photos are what you'll get if you grab your camera and look for a cute pose. But if you play with the dog, talk to him—in fact lead the dog's life and like it—you'll eventually come up with good ones. That's the word from Robert A. Hanks, New York specialist in pet photography. From his bag of tricks, Hanks offers two that may amuse you:

- Bark at your dog to make him pick up his ears and look alert. He may jump into your arms the first few times, but if you plant him back firmly and keep barking he'll probably stay put.
- Yawn widely a number of times if you want the dog to yawn. That's how Hanks got one very successful picture.

Hanks' technique is to stake out a definite

Hanks gets dog set in steady stance. Show dogs hold position well. Rubber mat gives firm footing.

area about twice the length and height of the animal. Focus on the center of the space with the camera firmly anchored to a tripod.

Back off so all of the dog will be recorded somewhere on the negative if he is snapped anywhere within the area. You can crop away the blank parts.

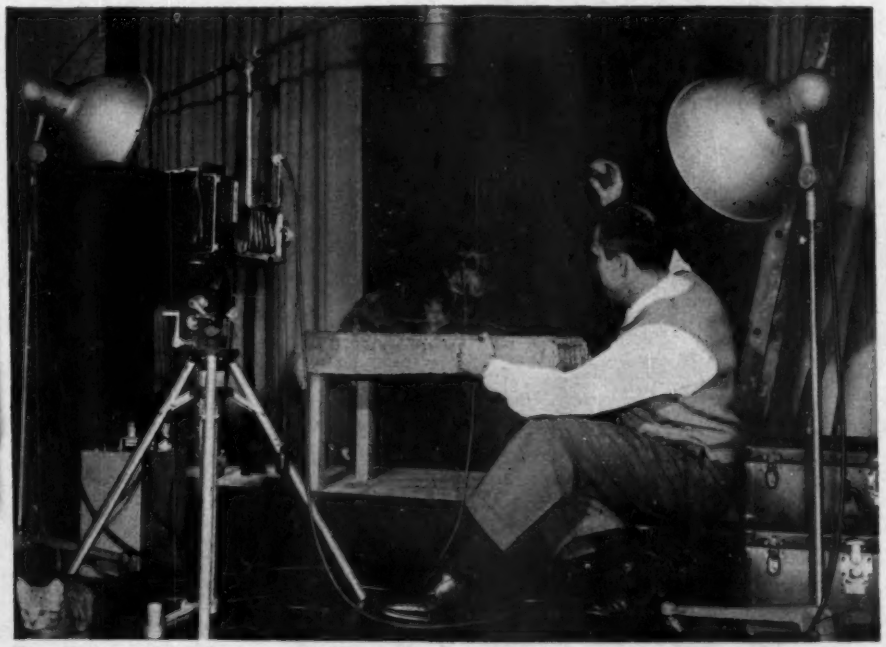
Outdoors, use a low camera angle and try to get clear sky behind the subject. Indoors, where Hanks prefers to work because there are fewer distractions for the dog, a blank background is readily arranged. Under no circumstances shoot against patterned wallpaper or furniture with fancy covers. An effective backdrop is a small white tablecloth or bedsheet stretched taut against a wall and supported by inconspicuous push pins.

Make the Dog Comfortable

Much of the secret of getting a dog to sit or stand still for even a fraction of a second is to provide him with a comfortable base. For small dogs, Hanks uses an end table about two feet long covered by a bath mat of neutral shade. A heavy Turkish towel is also good. For standing-up shots on the floor, he moves the table aside and places the dog on a strip of ribbed rubber matting, the stuff used for stair treads. The dog's feet grip this surface well and he feels firm and secure on it.

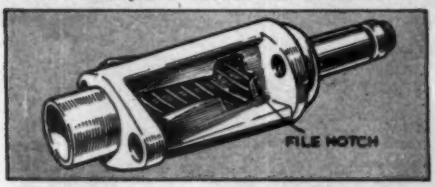
You need a camera with a shutter speed of 1/100 second or faster and a lens rated

[*Continued on page 248*]



Remote control for shutter and lights enables Hanks to shoot the instant he has lured dog into good pose. Note that two lights are located on the sides of subject, one overhead.

Pencil Sharpener Gives Finer Point



ANY pencil sharpener can be altered to sharpen draftsmen's pencils so fine that they need not be sanded. Disassemble the sharpener. At the end where the two cutters meet, you'll find a thin rib or fin that acts as a pencil stop. File a very small notch in the center of this fin. This allows the pencil to enter the sharpener farther and results in a much sharper point.—*Frank Butrick, Jr., Alma, Mich.*

Hand Rotator Turns TV Antenna

YOU can swing your TV antenna around to face the station you want to watch with this hand-operated rotator. Pulleys and cables connect it to a control lever that can be operated from inside or outside the house. Manufactured by Neo Products Corp., Erie, Mich., the "Select - A - Beam" fits any standard-size antenna mast.

Clock Operates Radio or TV Set

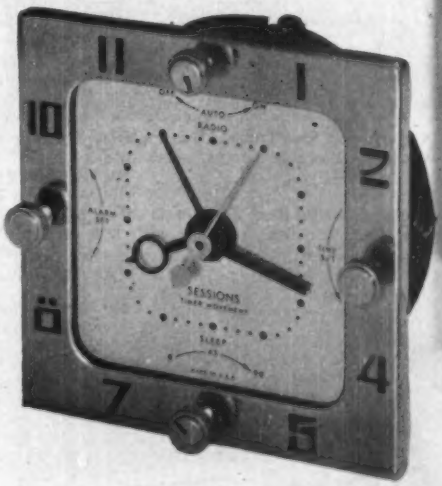
THE timer clock at the right will turn on your radio at any pre-set time in the morning and then sound an alarm 10 minutes later if you fail to awake. At night, it will turn off the radio up to 90 minutes after you've gone to bed. It will also turn on a radio or television program at any pre-set time during the day and then turn it off 1½ to 2 hours later if you forget to. Sessions Clock Co., Forestville, Conn., makes it.

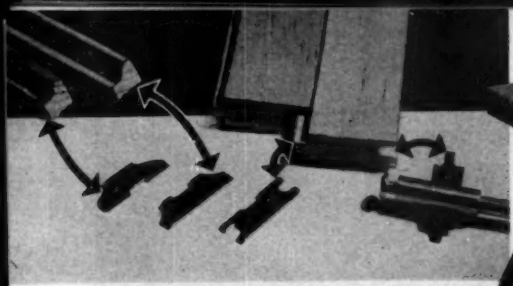
Pad Overall Pockets for Longer Wear

THE back pockets of work overalls soon develop holes in the bottoms if you make a habit of jamming tools into them. Pad the bottom of each pocket with a thin piece of sponge rubber and it will wear longer—*George Kapitan, The Bronx, N. Y.*

Water Repellent Protects Masonry

THE masonry walls of your home will shed water like a duck's back after you brush or spray them with this new silicone liquid, reports the manufacturer. The product, called Siliphane, doesn't change the wall's color, but coats the pores with a thin water-repellent film. Among the types of above-grade walls that can be treated are cinder-block, concrete, brick, limestone, and asbestos-shingle. The maker is Prima Products, Inc., New York City.





Tiny jobs look big. Spread out above are samples of work you can do on table-top shaper at right. Arrows indicate fly cutters used for each. Cutter at far left will shape ⅜" cove or fillet and 3/16" ogee besides concave cut shown.

Hands show scale of this practical accessory for a modelmaker's shop. A two-piece bracket clamps rotary hand tool rigidly in position.

Hand Grinder Drives Model Shaper

Simple table adapts power tool to cutting small-scale molding.

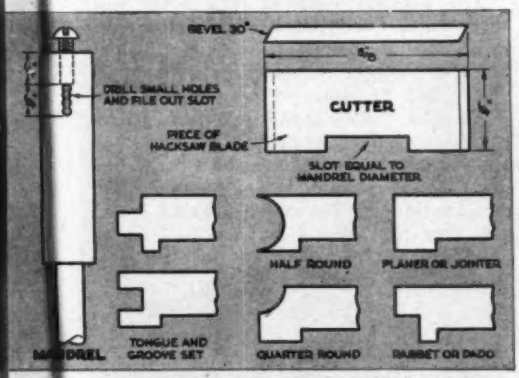
IN MODELMAKING, there's frequently need for small-scale planking and molding. This benchtop spindle shaper will do the job. Easily made fly cutters will shape a full range of contours.

A rotary hand tool supplies the power. The flexible-cable type could also be used.

The base is an easy assembly of wood parts. Main object is to mount the tool rigidly and support it at exactly 90° to the table. The neck of the tool should rise far enough through the 6" by 6" top so the chuck can be reached. A U-shaped tool slot can be made in the fence by boring a ¾" hole just touching the front edge and then sawing straight sides.

A standard rotary-tool mandrel is slotted as shown to hold fly cutters filed from sections of old hacksaw blades. Slots in the cutters center them. Cutters can be made on the shaper itself. Chuck a grinding wheel in the tool, grip a cutter blank in a small machinist's clamp, and hold the clamp flat against the table while grinding.—*Evan Wright, Topeka.*

Sharpening circular-saw blades is easy with E. M. Love's pointers, in next month's PS.



Cutters are filed from hacksaw blades. Existing screw in mandrel clamps cutter in slot.

Crosspiece holding bracket is offset between side pieces so tool lines up with hole in top.

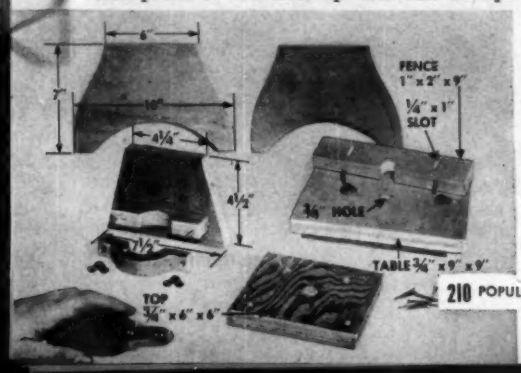
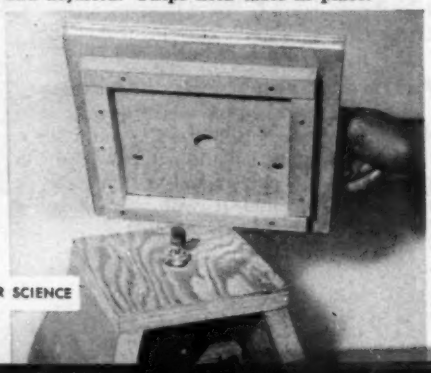


Table lifts off top so cutters can be changed and adjusted. Strips hold table in place.



If the lubricants that ease your car on its way are all a big mystery, these kitchen stunts will show you . . .

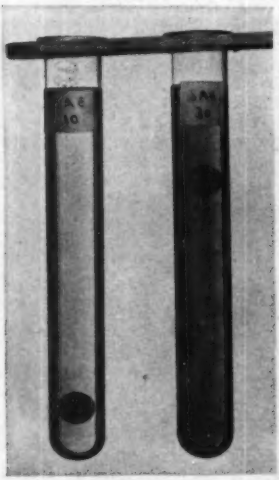
What You Should Know About Motor Oils

By Kenneth M. Swezey

LUBRICATION lingo sometimes sounds pretty mysterious, full of terms like viscosity, high-temperature sludge, and pour point. The simple stunts described here will help you understand these and other characteristics of automobile oils. You can perform them in your shop or kitchen with common household articles for equipment.

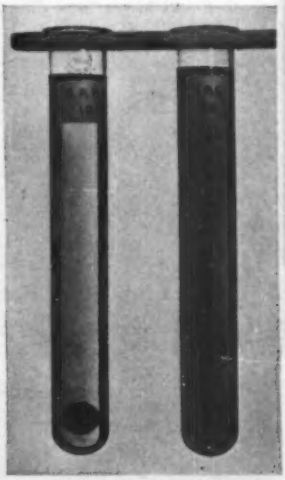
After you've finished, your new knowledge will help you pick the best oil for the season ahead when you switch to winter oil this fall—whatever brand you buy.

If oil flows easily, it has a low viscosity. If it creeps like molasses, its viscosity is high. Specific viscosities are designated by a numbering system developed by the So-



What is viscosity? An oil's viscosity is measured by its resistance to flow—the slower it flows, the more viscous it is. You can compare two oils as in photo at top of page. Drop a marble simultaneously into each of two test tubes—one filled with SAE 10 oil, the other with SAE 30. You'll find that marble falling in oil with low number hits bottom before other has reached the halfway mark (left). First has low viscosity, second a high viscosity.

Temperature changes it. You can see how heat affects viscosity by repeating marble test. This time set test tubes in water and heat oil to about 180° F. Both marbles will then fall faster than when oil was cold. Marble in heavy oil drops nearly as fast as other (right).



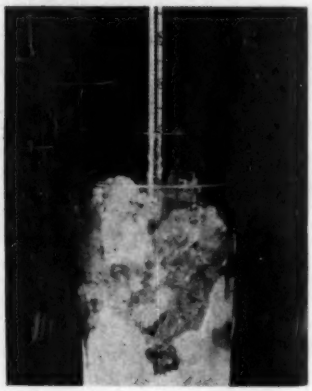
ciety of Automotive Engineers. SAE 10, for instance, is a thin, easy-flowing oil. SAE 20 and 30 are progressively heavier.

Viscosity changes with temperature. If the temperature rises, viscosity drops; that is, the oil becomes thinner. If the temperature drops, viscosity rises. If the temperature continues to drop, oil eventually becomes so thick it won't flow at all. A temperature 5° above the temperature where flowing stops is an oil's pour point.

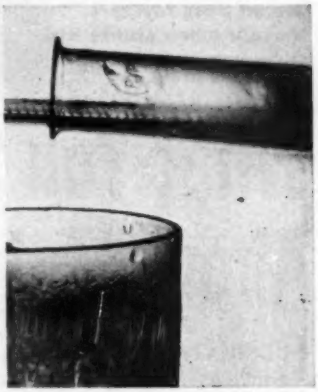
For winter use, then, you can see why you should select an oil with a pour point below the lowest temperature expected.

In ordinary oils, pour points go down with the viscosity rating. SAE 30 oil has a pour point of about 40°; SAE 20, 30°; SAE 20-W, 10°; and SAE 10-W, 10° below zero. To lower the pour point of the 10-W still farther, 10 percent kerosene is sometimes added to keep it fluid to minus 30°.

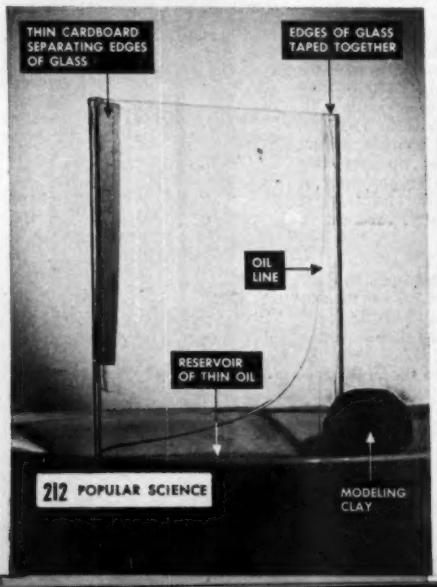
What does the "W" mean? It indicates an oil adapted for cold-weather starting. When oil stops flowing, it doesn't



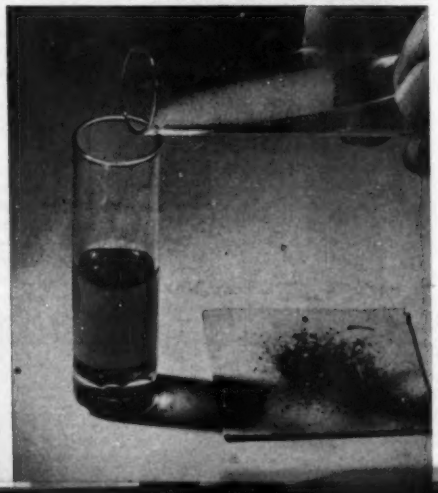
Pour point. To find this embed a test tube of SAE 30 oil in a tumbler of cracked ice mixed with salt, and place a thermometer in oil. At each 5° temperature drop, lift tube and tilt it to one side. Continue cooling as long as oil moves when tilted. When you can hold tube horizontally for exactly 5 seconds without seeing oil movement, as at the right, note thermometer reading. This temperature, plus 5°, is called the pour point of the oil.



How oil lubricates. Motor oil works its way into incredibly small spaces, partly by adhesive drag of moving parts and partly by capillary attraction. Setup below demonstrates the latter. Because of combined forces of wetting and surface tension, oil climbs up between the two sheets of glass—highest where they are closest together and lower in a diminishing curve as sheets get farther apart.



Low - temperature sludge consists of oil, water and dirt whipped up by engine into a black, unpalatable relative of mayonnaise. To make it, pour a little cold water into cold oil (below). Add dirt from vacuum-cleaner bag, and shake mixture violently. You eventually will get a sample of low-temperature sludge (right).



freeze in the ordinary sense; rather, it gels because dissolved waxes in it harden. Removal of these waxes lowers the pour point. Regular SAE 20 has a pour point of 30°, but removal of the waxes drops its pour point to 10°, and the oil then is designated as 20-W.

Which is better—light or heavy oil? As long as it can maintain a continuous film, a light oil is a better lubricant than a heavy one. It can squeeze into smaller spaces. It creates less frictional drag.

However, light oils do leak away faster in engines with worn parts. A good rule is to choose the lightest oil that can be used without excessive loss. A recent trend is to compromise—to use medium-weight, low-pour-point SAE 20-W for both summer and winter in moderate climates. This oil has the same viscosity at higher temperatures as SAE 20. Its pour point is 20° lower.

Why warm up an engine? If you make a practice of starting off without first

High-temperature sludge is composed of gums, resins and other oxidation products formed in a hot engine. To see what it's like, heat oil in a jar cover on a solid-top electric hot plate, left. (An open-coil heater may ignite the oil.) Work outdoors, for plenty of smoke results. As the oil heats, it thickens and blackens, as seen at right.

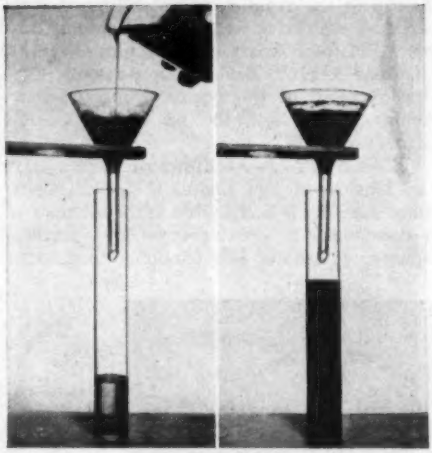
How water gets into crankcase. Oddly enough, the water that helps produce low-temperature sludge comes from the gasoline. Gasoline consists of about 15 percent hydrogen, 85 percent carbon. When it burns, its hydrogen combines with oxygen in air, producing water that turns to steam. If engine is hot, this passes out the exhaust. If engine is cold, some condenses and trickles down into the crankcase. You can see this by holding a cold tumbler over a cigarette-lighter flame. (Lighter fluid is a close relative of gasoline.) Inside of glass soon has a film of condensed moisture, as at left. Continue to hold glass over the flame, however, and the water will disappear (right) just as it does from a hot engine.

warming up the engine, you will soon churn up a nasty mess of low-temperature sludge in the crankcase. Accompanying stunts show what this sludge is like and how water helps build it up.

High-temperature sludge, demonstrated in another experiment, can be kept down by avoiding long stretches of high-speed driving and by maintaining the engine cooling system and oil circulation in good condition. Premium and heavy-duty oils also help prevent high-temperature sludge, for they contain chemical additives put in by the manufacturer partly for this purpose.

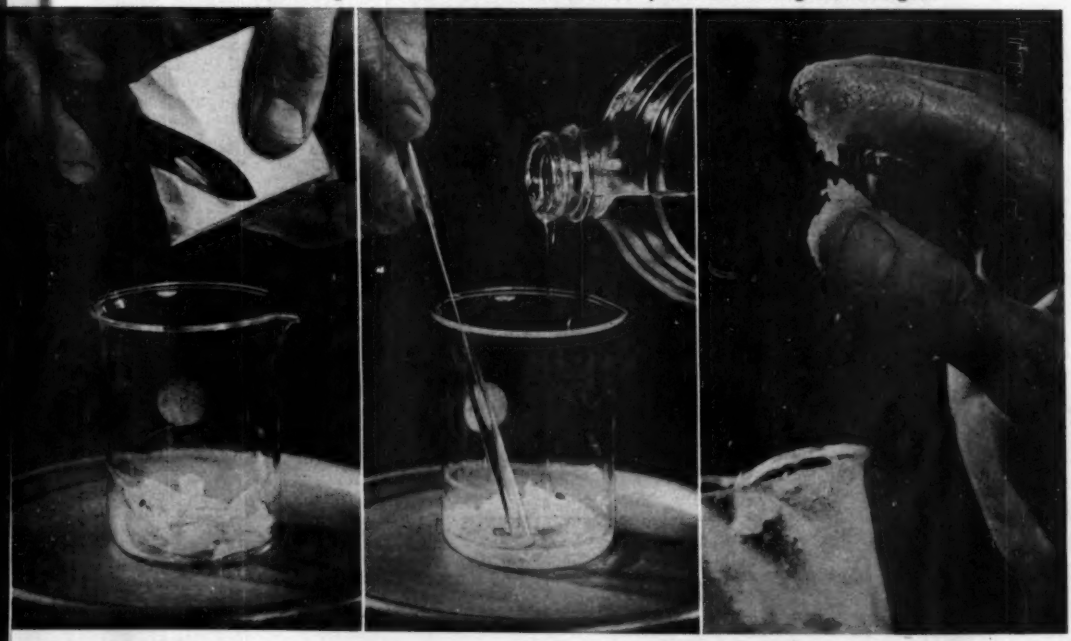
Greases are actually oils thickened by cooking with soap. The nature of the grease is determined by the type of soap.

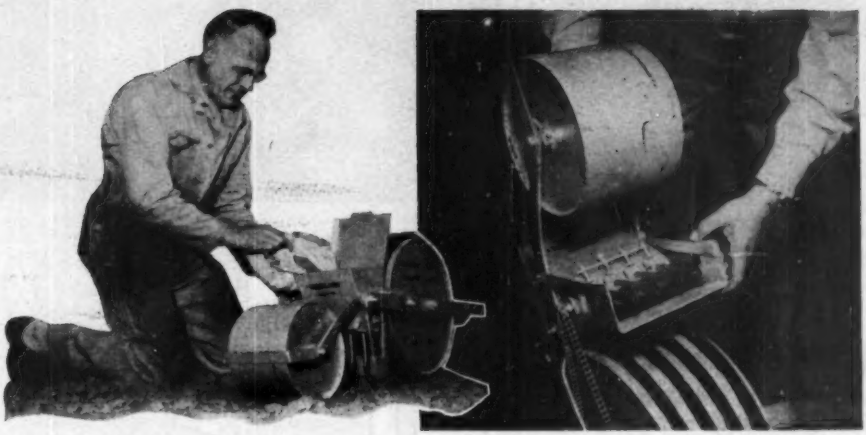
Calcium soap, for example, makes the moisture-resistant cup grease used on water pumps. Aluminum soap forms a clear chassis lubricant that resists both moisture and heat. Sodium soap produces a clinging, fibrous-appearing grease used for wheel bearings and universal joints. One of the stunts shows you how to make a sample of the latter type of grease. END



How filters function can be shown by pouring oil mixed with vacuum-cleaner dirt through funnel containing a wad of absorbent cotton. First oil that comes through this improvised filter is clear (left). Keep pouring dirty oil, however, and cotton will become saturated with dirt. Oil then comes out as dirty as it went in. That's why filter elements need changing.

Grease is oil plus soap. You can make a sample of sodium grease by heating a little ordinary hand soap and either motor oil or household mineral oil. First shave soap into small beaker. Add about an equal quantity of oil. Then heat with stirring until all water has boiled away and mixture has darkened and blended. Let it cool and you'll have the grease at right.





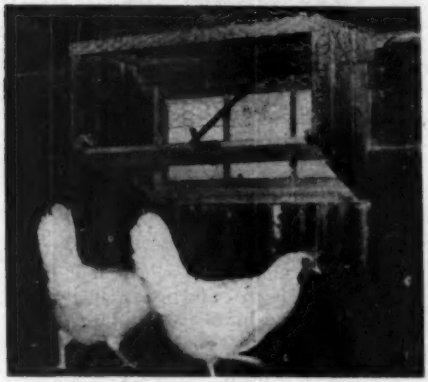
Machine Plants Seeds One at a Time

To SAVE seeds when sowing his 750-acre farm, L. M. Marihart, of Salinas, Calif., built this seeder. Towed by a tractor at four m.p.h., it pops in one seed every 1½" (or multiple of this distance). Agitator wheels in the hopper force a seed through an adjustable screen. Rims on the big drum cut furrows and the small drum covers the seeds. A chain drive from the big drum controls the interval at which seeds are dropped. Marihart cut the number of tomato seeds used per acre from ½ lb. to 1/6 lb. Saved, too, is the cost of thinning.

Traps in Vacant House Need Antifreeze

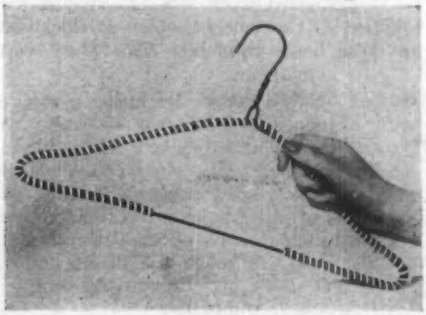
IF YOU leave a house vacant during cold weather, remember the water traps when you drain the pipes. Drain water from the traps or else fill with kerosene or a strong brine made of common salt and water.

Window Stops Henhouse Drafts



HINGED at the bottom, this window swings downward inside a screened box. The screen keeps the poultry from getting out and the top-opening window keeps drafts off the hens below. A notched bar regulates the opening.—*D. F. Costello, Fort Collins, Colo.*

Plastic Covering Pads Wire Hanger

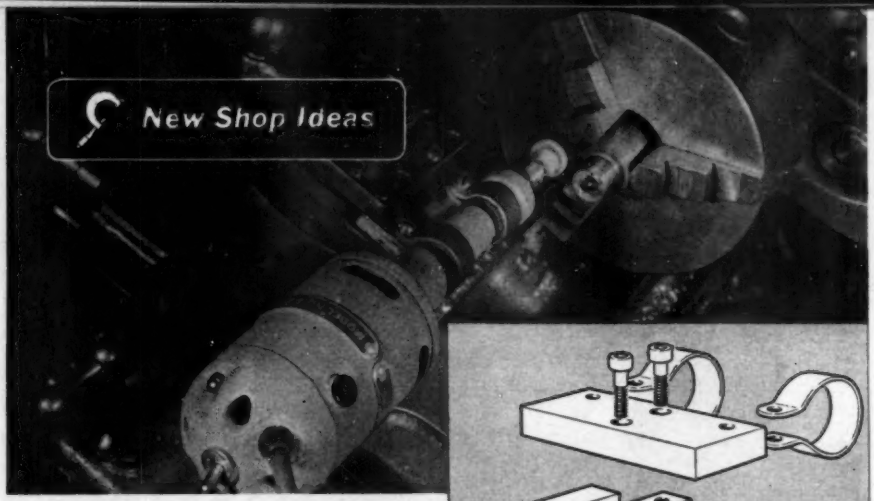


IF WIRE hangers are wrapped with the plastic spiral used on phone wires, the ends are less likely to cause creases. Clothes won't slip off easily, either.

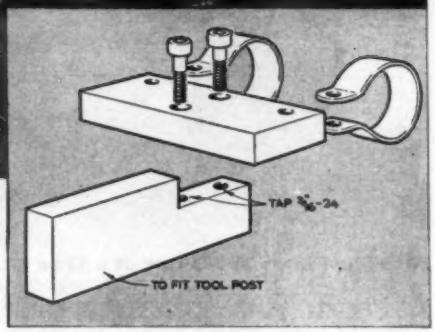
Holes Signal Gouging Depth

WHEN hollowing out an irregularly shaped wooden object, it's hard to know whether you've gone deep enough or so deep you're about to cut through.

A quick and easy way to eliminate constant checking is to drill a number of small holes to the desired depth at all critical points. Then, as the holes disappear, you know you've gouged to maximum depth.—*Basil Clark, Evansville, Ind.*



New Shop Ideas

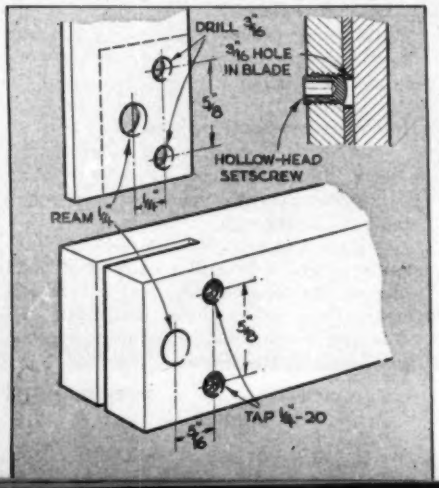


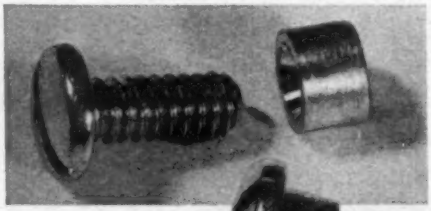
Grinding in the Lathe. Having a number of dies and punches to make, I finish-ground them to size, after hardening, with a small high-speed hand grinder. The neck of this tool was wrapped with tape in two places and fitted with straps. Bolted to a piece of flat bar stock, they gripped the neck tightly. The bar was clamped in a turret attachment. For the ordinary tool post, a T mounting could be made as in the drawing.

The chucked work was run against the rotation of the wheel (which is clockwise in these hand grinders). The wheel was advanced half a thousandth or less at a pass.

Grinding also proved the answer to making neoprene-faced disks, which had to be perfectly concentric, for a friction drive. The material was permanently clamped between the flanges that were to drive it. Mounted on an arbor, it was ground dead true.—*Floyd McGuckin, Ridgewood, N. J.*

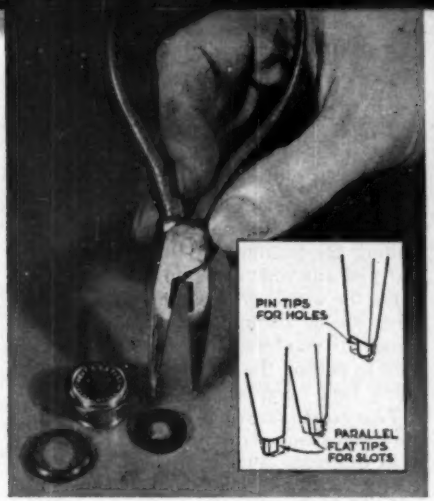
Adjust That Square. By fitting a square with a pivot pin and two setscrews as shown below, you can make it adjustable to hairline accuracy. The chamfered ends of standard hollow-head setscrews, bearing on the edges of offset holes in the blade, give both a sensitive means of adjustment and a positive lock. To move the blade simply loosen one screw and tighten the other.—*N. H. Mitchell, Montreal.*





Shoulder Built Up. It's difficult to cut a clean thread right up to a shoulder, particularly on small screws, since they are weakened if undercut much at that point. One solution is to build up a shoulder as shown. Chuck a bit of rod, drill it through, run in the thread with a tap mounted in the tailstock, and countersink deeply. Then turn to the required outside diameter and cut off square.

Such a shoulder will be concentric and, unlike a plain sleeve, will stay on the screw during handling and assembly.



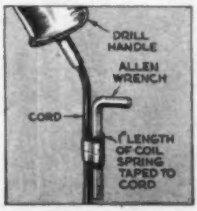
Pliers Used as Spanner. Round nuts and threaded rings used on photographic and other optical parts are easily damaged with ordinary tools. But a spanner for turning them can be made from a cheap pair of long-nosed pliers.

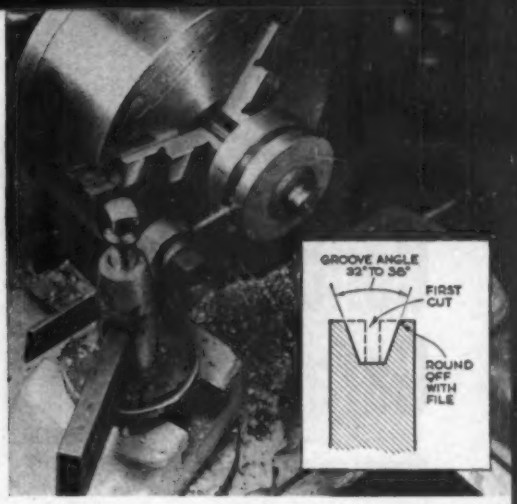
Grind the tips of the pliers' jaws to form short round pins that will freely enter the holes or slots in such nuts. If all the nuts have slots, you may prefer to grind the tips straight across like tiny screwdriver blades. In using the tool, hold the jaws at the required spacing with the fingers.—*Walter E. Burton, Akron.*

Handle for Hex Wrench. Any Allen wrench is a lot easier to use when fitted with a T handle.

In a piece of drill rod twice the thickness of the wrench, drill a 1"-deep hole a few thousandths smaller than the hex is across corners. Grind off the short leg of the wrench and drive the rest in. Drill the other end of the shank to a drive fit for a suitable cross bar.—*Wilber H. Fulker, Monument, Colo.*

Spring Keeps Key Handy. An electric drill without its chuck key is useless—and a hex key is especially easy to lose. To keep it handy, tape a short spring to the electric cord. If the key doesn't fit snugly, bend a turn or two of the spring aside to make it hold.—*Erwin La Haine, Grand Rapids.*

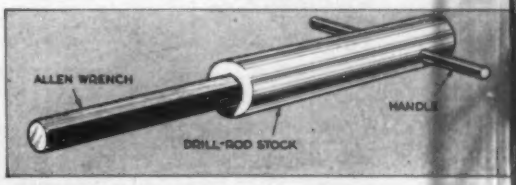




Turning V Pulleys. Special V-belt pulleys are easy to make with a sharp parting tool and the compound-rest feed.

Mount the blank on a true-running arbor. Make a cut straight in to the full depth with the cross-slide feed. Then lock the compound rest at half the included angle (19° for a 38° groove). Feed the tool in with the compound screw, moving the carriage for successive bites until the tool bottoms in the first cut.

Swivel the rest to the same setting on the other side, making successive cuts until the groove is brought to width.



Cross-Slide Chip Cover. You needn't fret about chips piling up on the cross-feed screw. Simply replace the regular cover plate with a longer one cut from sheet metal. Bend the sides down. Make it long enough to cover the screw even when the slide is all the way back toward you.—*Harry L. Truchelut, Atlanta, Ga.*

How to Build a Concrete-Block Garage PART 2

Simple carpentry and standard tools are all you need to put the roof on your garage and install doors and window.

By Denis Sneigr

WHEN you've finished the masonry work on your concrete-block garage, step back and look at it for a moment. You'll probably discover that you're a pretty good mason. All the blocks are laid and the anchor bolts set. Window and door openings are waiting for framing. So drop your trowel and pick up your carpenter's tools.

For the woodworking, the only tools you'll need are a hammer, saw, nail set and square. If you have a power saw, it'll help a lot in cutting the rafters, siding and trim, but it isn't essential.

The roof. Drawings on a following page show you shape and dimensions. Photos and other drawings detail roof construction.

This roof, with gable ends, matches the roof of the nearby house. The same kind and color of composition shingles were used.

You can save money by making the roof

Built of new concrete shadow block, walls look like beveled siding to match nearby house.

lumber do double duty. Use it to make the forms for the slab and later cut it up for rafters. Before sawing the lumber, protect your saw by scraping off concrete that may have stuck to it.

The doors and window. You have a wide choice of these—from low-cost ones you can build yourself to the fancier factory-built jobs. If you want to cut down the over-all cost of your garage, build a pair of barn-type doors hinged at each side. Doors that swing up range from those sold by mail-order houses that you install yourself to the more expensive ones that the retailer installs. The Overhead Door Corp., Hartford City, Ind., made the four-panel door for this garage.

A stock door is simplest for the side. But the builders of this garage, Picone Brothers, of Brooklyn, N. Y., who manufacture concrete products, wanted a door that would carry out the horizontal lines of the shadow-block walls. So they tailored a door of 10" beveled siding, the same kind that went into the gables.

The builder also made the window match the blocks. The two panes slope out at an angle as do the shadow blocks.

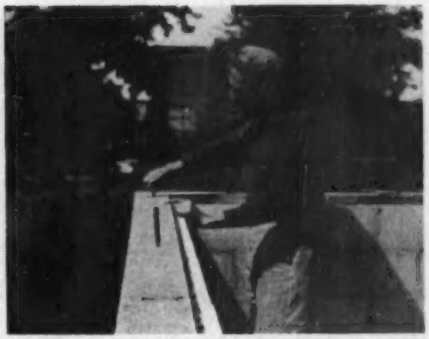
Painting concrete. Portland-cement base paint comes in different colors, is easy to apply and gives a durable finish. This paint is a powder that you mix with water to the consistency of heavy cream. Mixing instructions come with the package. Use a low, wide container for mixing. Then it will be easy to dip the scrub brush in the paint.

With your garden hose, spray a fine mist over the wall before applying paint. Dip the brush in the paint and scrub it well into the pores of the concrete. Don't use a soft-bristled brush. It won't work the paint into the pores as well as a stiff new brush.

Let the first coat harden eight to 12 hours. Then spray it with your garden hose. Keep it damp about 24 hours. While the wall is still damp, apply the second coat. Let it set for eight to 12 hours, and then keep it damp for about 48 hours.

Don't apply cement-base paint when the temperature is likely to go below 40° F. within 48 hours. Temperatures below 40° keep the paint from drying properly, causing it to chalk or craze. Crazing is marked by those fine, hairline cracks you've probably seen in concrete surfaces.

Photos and drawings on this and the next four pages show you step-by-step construction details.

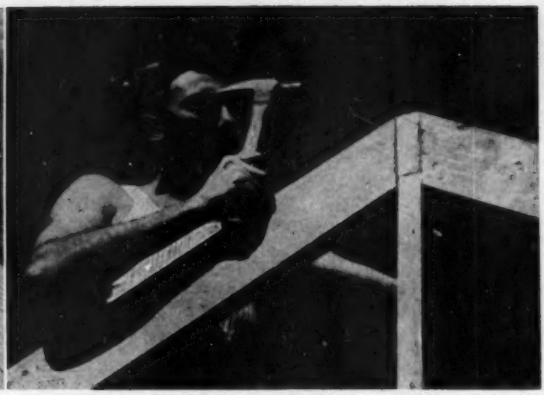


1. Setting plates. These can be two-by-sixes or two-by-eights. Plates used here are two-by-sixes, same ones that were in forms for slab floor. Drill holes for anchor bolts so edge of plate is flush with outside of wall. Use washers.

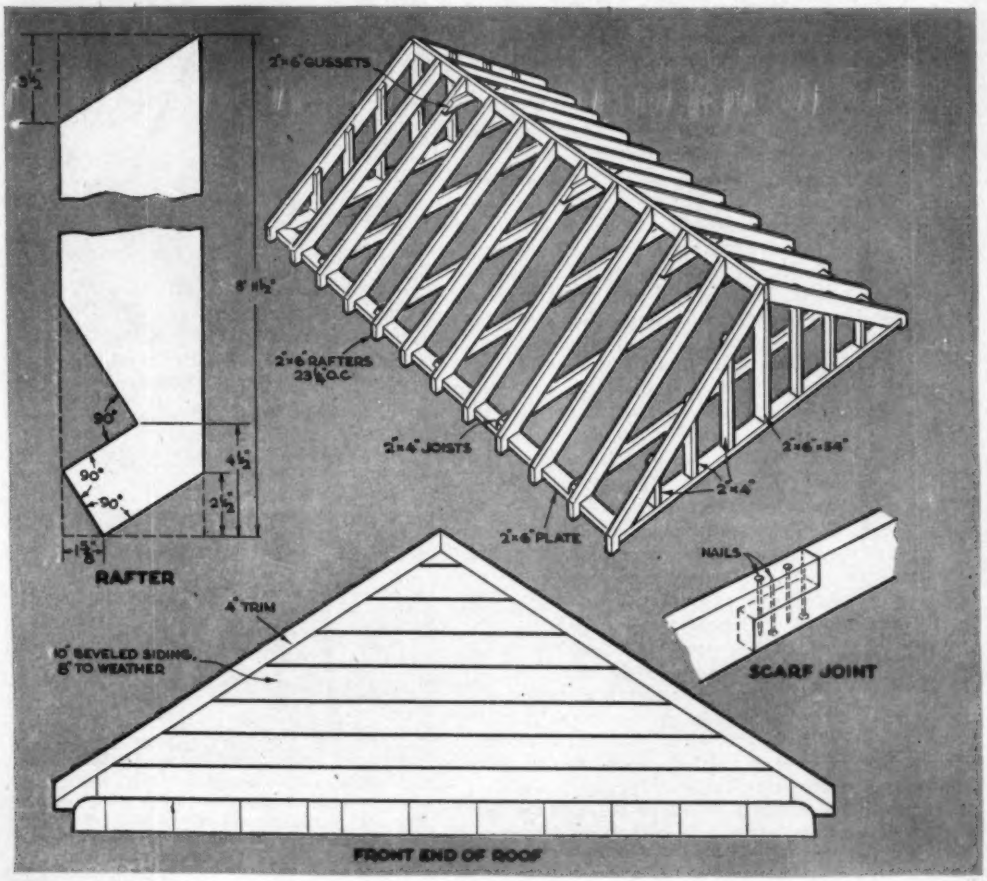
2. Supporting ridge pole. Find centers of end plates and nail two-by-six verticals there. These will support ridge pole. Nail on temporary braces until ridge pole and rafters stiffen structure. If you don't have a two-by-six long enough for ridge pole, join two with scarf joint, as in drawing on next page.

3. Marking rafter template. With ridge pole in place, mark a rafter for notch where it fits plate and for angle cut where it meets ridge pole. Notched end is trimmed to make it vertical. Drawing shows dimensions of rafters.

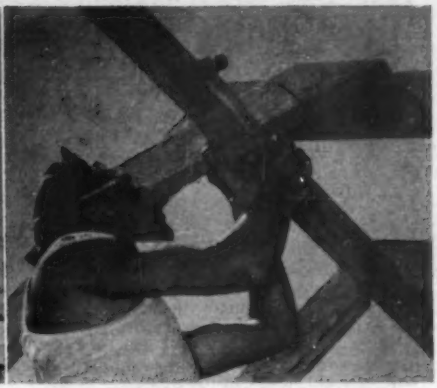
4. Laying out rafters. Saw the first rafter to shape and keep it as a template for laying out the other rafters. Then all the rafters will have exactly the same dimensions.



5. Nailing rafters to ridge pole. Photo above shows joint where rafters, ridge pole and vertical support meet at each end of roof. Drive nails through rafters into ridge pole.



6. Nailing rafters to plates. Before nailing down rafters, measure to be sure they will be properly spaced. Drawing shows correct spacing. Drive nails in from side of rafters.

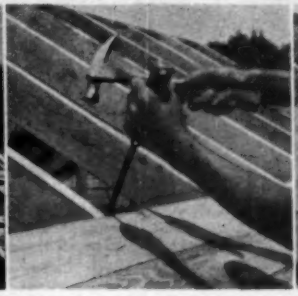


7. Bracing the roof. Three gussets, cut from a two-by-six, strengthen roof. Top edges of gussets are butted against ridge pole. Ends are trimmed flush with the rafters.

8. Sheathing the gables. Six two-by-four studs are nailed between plates and rafters at each end of garage. Sheathing is nailed to studs and to two-by-sixes that support ridge pole. Sheathing is trimmed flush with end rafters.

9. Setting joists. Five two-by-four joists are nailed to plates and rafters. Hardware for the Overhead Door is hung from joist at front of garage. Planks laid across joists provide storage space. Joists also strengthen roof.

10. Sheathing the roof. Tongue-and-groove sheathing is nailed to rafters (below left). To get tight fit, drive point of old screwdriver into rafter and pull on handle (center) while you toenail plank. When you work on a roof of this pitch, nail toeboards to sheathing (right).



Turn the page, please, for 12 more photos.

11. Laying drip-course shingles. Fasten roofing paper to sheathing with large-headed roofing nails. Then put down drip course of composition shingles. Lay drip-course shingles reversed—with tabs pointing toward roof peak and with straight edges overhanging eaves ½".

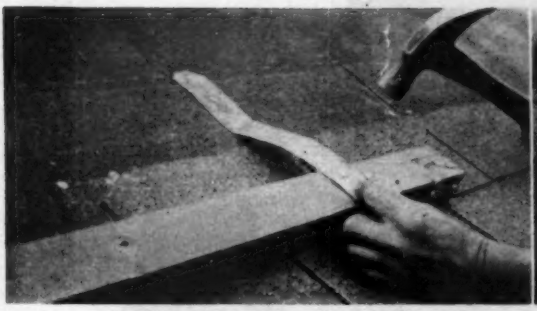
12. Laying first-course shingles. This course completely covers drip course. First-course shingles are laid with tabs flush with drip course. Then continue with other courses. Instructions that come with shingles tell you how much of each course is to be exposed to weather.

15. Finishing the roof. Cut out squares of composition shingles and lay them over the peak. Standard procedure is to lay the squares halfway from one end of roof peak and then start at the other end and lay squares to meet those you've already laid.

16. Installing trim. Ends of rafters on each side of garage are boxed in with trim. Trim boards on ends of garage lap over ends of side-trim boards. Fasten trim to ends of rafters with finishing nails. Set the nailheads and putty over them before painting.

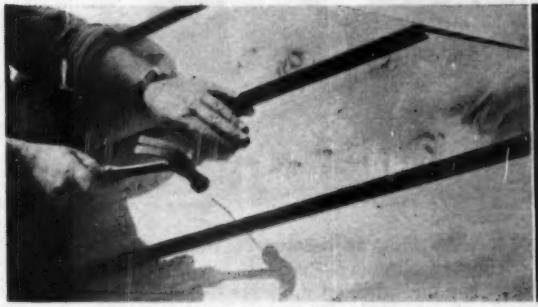
19. Preparing to paint. Joints between blocks must be smoothed before painting. Mix mortar and sand in equal amounts. Add water to make workable mixture. Wet joints, apply mortar and scrub with brick until joint is flush.

20. Painting concrete blocks. Brush or hose water on the wall before applying Portland-cement paint. Use a stiff-bristled scrub brush to work the paint well into the pores in the concrete blocks. Two coats usually are applied.



13. Fastening toeboards. You'll need toeboards when you work on roof. By using this gimmick, you avoid nail holes through shingles. Cut strip of tin. Nail one end of strip to toeboard and other end to roof. Use two or three strips, depending on length of toeboard.

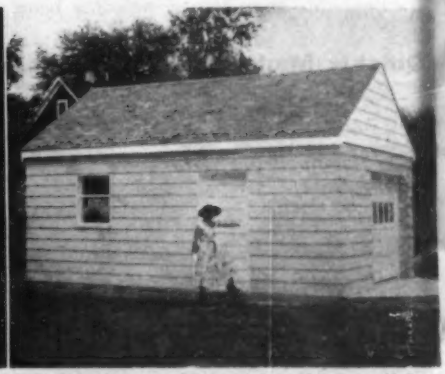
14. Removing toeboards. Lay shingles right over the tin strip. When you no longer need toeboard, bend up the shingle covering the tin. Snip the tin strip up under the shingle. Then the toeboard can be lifted off roof. Let the small piece of tin remain under shingle.



17. Finishing the gables. Beveled siding on the gables carries out the horizontal lines of the shadow-block walls. Like the blocks, this 10" siding has 8" exposed to weather. Attach siding to sheathing with finishing nails. Set and putty over the nailheads.

18. Framing door and window. Door buck, to which door frame will be nailed, is 1½" by 7¾" stock. Stock for window frame is same size. These pieces are held in openings by 2½" steel cut nails that are driven through the planks and into mortar joints between blocks.

21. Installing main door. The kind that swings or slides up is best for a garage. You can install this type yourself by following the manufacturer's instructions. However, to cut costs, you can build hinged doors for your garage.



22. Finished product. Like gables, small door is made of beveled siding to carry out horizontal lines of concrete shadow block. Window panes also slope out in same way blocks do. Garage was painted to match house. END

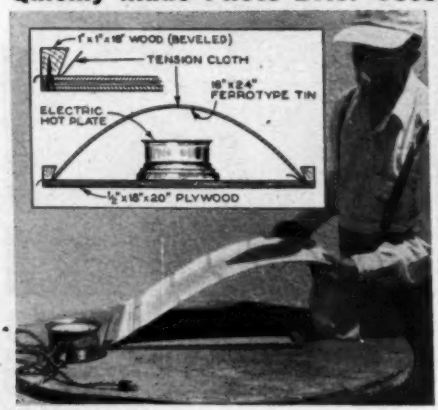
Gas Mule Totes Pack, Boosts Hiker

THIS homemade pack mule not only carries a heavy load for Harold T. Austin, of Seattle, but also gently nudges him up mountain trails. He reports it can easily handle a 200-lb. pack.

Unloaded, the machine negotiates 28-percent grades. When the going is hard, Austin puts a strap between the handles and leans back. Besides increasing wheel traction, this gives him a welcome boost. It saves him, he reports, four-fifths of the effort of climbing.

The one-wheeled mule started out in life as a four-cycle garden tractor with an automatic clutch. Austin modified it to push instead of pull, installing tubing handles in front. Between them is a 22" by 60" welded rack. The three-horsepower engine runs four hours on a gallon of gas and drives the unit at a top speed of 300' a minute.

Quickly Made Photo Drier Uses Electric Hot Plate



YOU'LL get glossy prints fast with this easy-to-make photo drier. It's planned for an 18" by 24" ferrotype tin, which will buckle up between the end strips to provide space for the hot plate.

One end of the tension cloth is anchored under an end strip. The other is free. After prints have been rolled on, the tin is placed under the cloth and the cloth pulled tightly across it. Both cloth and tin are then buckled and hooked against the end strip. To confine the heat, I shove one side of the drier against a wall and seal the other with a piece of asbestos board. A tin baffle over the hot plate helps distribute heat evenly.—*Gilbert C. Close, Hawthorne, Calif.*

DO IT THE EASY WAY

Put the date on leftovers before storing in refrigerator. Mark dishes with a grease pencil and you'll know at a glance which ones to use first.

To clean cut glass that's really dust-covered, use a brass-bristled suede-shoe brush. The fine stiff wires will loosen stubborn grime.

To keep notebook and pencil handy in the kitchen or shop, fasten a bit of rubber tubing to the wall with a cup hook. Hang up the book and insert pencil in the tubing.

To start a nail in an awkward, unhandy position, hold it in place with a magnet. A broad magnet can be used as a hammer to give nail or brad a husky starting tap.

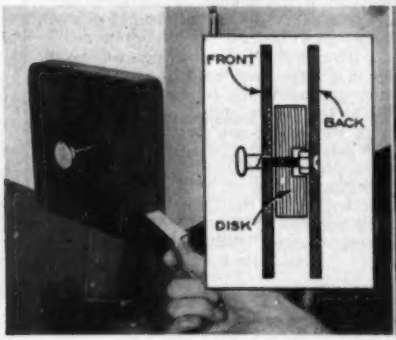
Dispenser Keeps Freezer Tape Handy on a Cabinet Wall

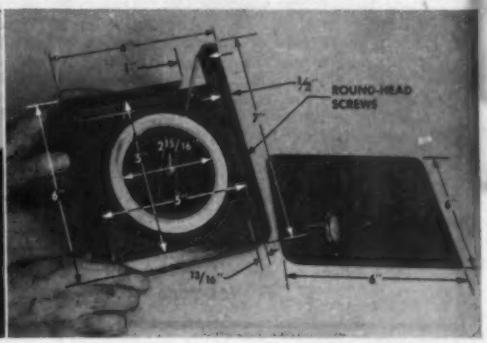
THIS freezer-tape dispenser helps like an extra hand when you're wrapping food for freezing, and is equally convenient wherever masking or cellulose tape is used. It holds rolls up to ¾″ wide.

Two pieces of ⅜″ fiber board form the front and back. Put the boards together and drill a hole through their centers for a long bolt. Attach the 13/16″-wide wooden framing to the back with glue and countersunk screws. Round off the corners on both box and cover. Sink two screws or pins in opposite sides of the framing and drill matching blind holes in the inside of the cover, to keep it from turning. Put the bolt through the back and secure tightly with a nut.

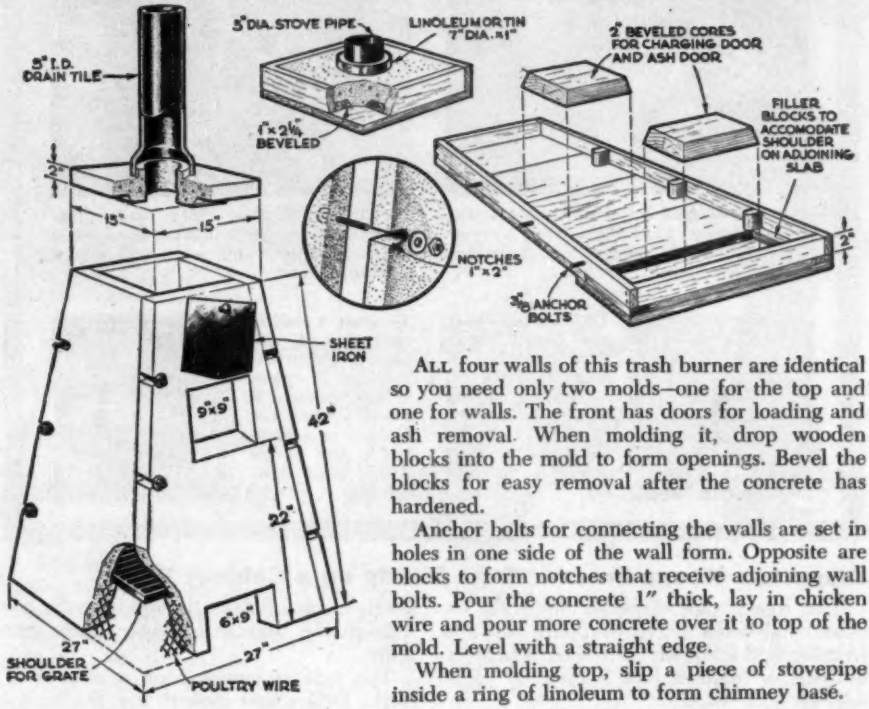
The tape is mounted on a disk of ¾″ stock. Drill a hole through the disk for the bolt to pass through and counterbore the back side for the nut.

Nail a section of serrated metal to the projecting side of the box to act as a cutting edge. Place the tape over the disk, sticky side up, making certain it doesn't touch the frame anywhere. Place the cover over the bolt and use a threaded drawer knob as a nut.—*Walter Haase, Hartford.*





Concrete Incinerator Made in Two Molds



ALL four walls of this trash burner are identical so you need only two molds—one for the top and one for walls. The front has doors for loading and ash removal. When molding it, drop wooden blocks into the mold to form openings. Bevel the blocks for easy removal after the concrete has hardened.

Anchor bolts for connecting the walls are set in holes in one side of the wall form. Opposite are blocks to form notches that receive adjoining wall bolts. Pour the concrete 1" thick, lay in chicken wire and pour more concrete over it to top of the mold. Level with a straight edge.

When molding top, slip a piece of stovepipe inside a ring of linoleum to form chimney base.

ELECTRIC WAFFLE IRON

If the waffles stick, the grids may be dirty or burned. Clean them with a wire brush, and brush them with vegetable oil or other shortening while hot. Waffles made from batter with too little shortening will tend to stick. If the batter contains cut-up fruit, bits of chocolate, too much sugar, and so on, the waffles may stick.

If it will not heat, the circuit is open. First check the outlet itself. The open could be in the plug, cord, switch, thermostat or heating elements. If it is in a heating element, a new element can be installed. A wire mending sleeve can be pinched over the broken ends to make a temporary repair. If the element and connections are good, the open is probably in the thermostat.

If it does not heat up enough, the iron may be plugged into a circuit that is overloaded with too many other appliances. The voltage could be too low to produce satisfactory waffle baking. If voltage is normal, thermostat may be adjusted too low, or it may have burned or dirty contacts.

If waffles do not bake evenly, insufficient batter may have been used. Too little batter does not allow the top or edges of the waffle to touch the upper grid, so these parts of the waffle will be underdone.

If it gets too hot, the thermostat is not adjusted properly, or else the thermostat is not working. Using an AC baker on direct current will cause the thermostat contacts to weld together. (From *Electrical Appliance Servicing*, by William H. Crouse.)

FOR YOUR POPULAR SCIENCE INFORMATION FILE

POPULAR SCIENCE

readers know that they get smoother performance and quick starts when worn-out spark plugs are replaced with

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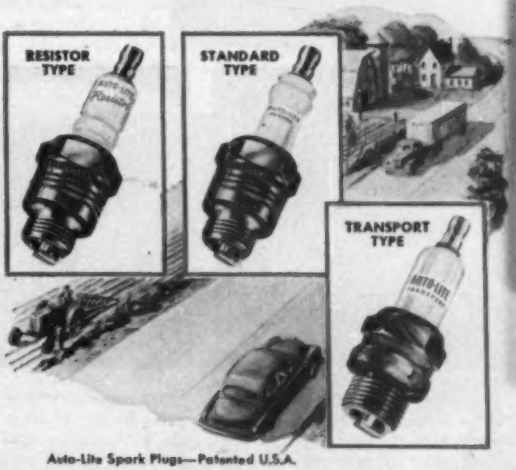
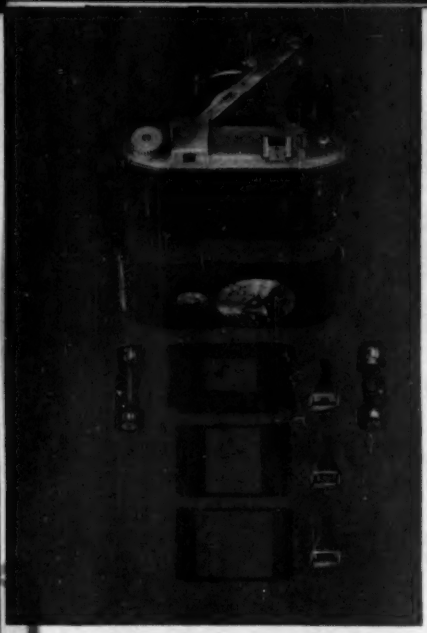
See your Auto-Lite Spark Plug Dealer today, because "You're Always Right With Auto-Lite."



Auto-Lite Spark Plugs—Patented U.S.A.

TUNE IN "SUSPENSE!" . . . CBS RADIO MONDAYS . . . CBS TELEVISION TUESDAYS



Color Cues

Inexpensive kits adapt Kodak Tourist and Reflex Cameras for Kodachrome Film
Kodak Tourist Adapter Kit, $15.50 (left), and the Kodak 828 Adapter for Kodak Reflex Cameras, $5.35 (lower left), permit picture taking in gorgeous full color on Kodachrome or Kodacolor 828 Film. The Tourist Adapter Kit, for de luxe "Tourist" models, also lets you take economical half-size and square pictures on all Kodak 620 Films. Both kits include back-frame masks, view-finder masks, and special spool baskets.

For dramatic skies without changing other color tones
By polarizing sunlight, a Kodak Pola-Screen can change a vacation snapshot into a prize-winning photo. For color, black-and-white. Accessory Kodak Pola-Screen Viewer slips over handle—"previews" varying sky tones you can obtain. Pola-Screens, from $6.50. Viewer, $6.50.

Get in the picture yourself
The Kodak Auto-Release automatically trips shutter 10 seconds after you set it. For cameras with cable release socket. $4.50 (cable release not included).

Share color prints with friends
From 35mm. or Bantam-size Kodachrome transparencies you can now get Kodacolor Prints (3½x5 inches), $.36 each, plus $.40 for negative on first print from each slide.

Share duplicate slides, too
For friends with projectors or viewers, there's no more welcome gift than "dupes" of your favorite slides. One to three duplicate slides, mounted, $.25 ea.

EASTMAN KODAK COMPANY

"Never-fail" flash! Ingenious new device assures correct flash synchronization every time!

In single flash or multiple flash, you may have experienced costly flash failures. Or perhaps you've been disappointed with shots "out of synch." But now there's a simple adapter made by Kodak that puts an end to worries like these once and for all. It's the Kodak B-C Flashpack. Here's how it works:

If your present flash unit accepts two "C" batteries end to end, remove these batteries. Take the Kodak B-C Flashpack, insert a 22½-volt photoflash battery, and substitute this combination for the two "C" batteries.

Replace the reflector and you're ready to take pictures. The battery in the Flashpack charges the condenser, which releases an unfailing abundance of energy to ignite the lamp. Fires up to three extension units in perfect synchronization. Disk for shorting out battery contact in extension unit is supplied with Flashpack. Price (without battery), $2.95.

Highly popular Flashholder
Kodak Flashholder, Model B, with Flashguard, attaches easily to any camera that has a flash shutter. Back of reflector carries exposure data. Kodak 2-Way Flashguard (not illustrated), a hood that slips over reflector, offers protection in case lamp shatters. Diffuse side of Flashguard produces softer illumination for color shots.
Price, complete, $12.35.

Be sure to see all of these accessories at your dealer's.

Prices subject to change without notice, include Federal Tax where applicable. Consult your dealer.

Kodak

ROCHESTER 4, N. Y.

FOR SURE QUICK STARTS
INSIST ON
BOWES SEAL FAST
Corrodeless TERMINAL Battery Cables

Most battery cable trouble starts at the terminal because of corrosion or bad fit. Bowes "Seal Fast" battery cable terminals positively will not corrode. They are specially engineered, tailored to fit the posts snugly, assuring longer cable life and full power from your battery. Stop battery cable trouble before it begins. For sure, positive starts insist on Bowes "Corrodeless Terminal" Battery Cables—then you'll get all the power your battery is designed to give you.

BOWES DEPENDABLE SPARK PLUGS Assure SMOOTHER MOTORING

There is a Bowes Spark Plug specially designed for your car! Oversize Special Alloy Electrode—with welded construction for positive connection assures longer life. One-piece, leakproof construction.

Every Bowes Plug is individually tested to assure complete motoring efficiency. INSIST on BOWES SPARK PLUGS FOR SMOOTHER MOTORING.

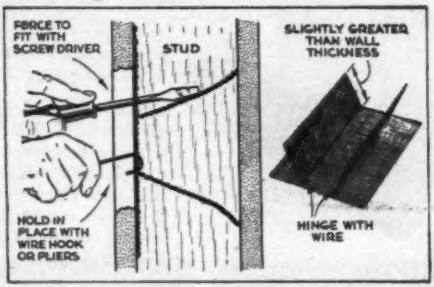
BOWES "SEAL FAST" CORPORATION
INDIANAPOLIS 7, INDIANA

Hypo Needle Makes Lettering Pen

You can make a good lettering pen from a discarded hypodermic needle. Solder a cut, bent pen nib to the needle's head (see inset). Grind the needle to the length you like. Clear its hole with fine wire, and round the tip slightly with crocus cloth or an oilstone to prevent scratching. Fill the top with ink, push the wire down through the ink into the hollow point, and pump it up and down to start the ink flowing.

Use an old hypo syringe for washing out the pen. Insert it with the plunger pulled back, depress to expel the ink, and pump water in and out. Store point with starting wire in it.—*S. Becker, Tucson.*

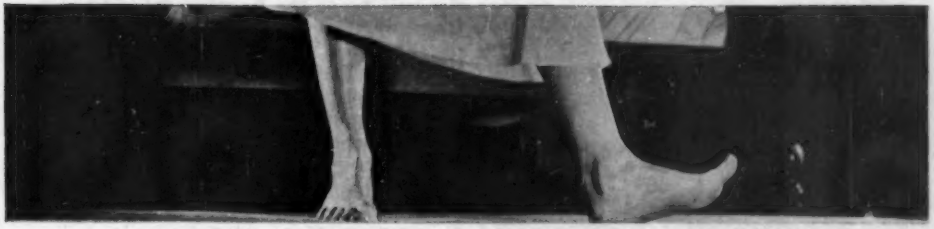
Patching Plasterboard Walls



A SIMPLE method of repairing holes in plasterboard walls is shown above. Cut a piece of hardware cloth or wire lath a bit larger than the hole. Cut two more pieces and attach to the patch with wire. Bend the patch and slip it through the hole. Hold it in place with wire hooks or pliers and, with a screwdriver, force back the hinged supports until they're wedged against the back wall. The patch will stay firmly in place while plaster is applied.—*Dale C. Reed, Arlington, Va.*

Capped Jar Stores First-Aid Items

BANDAGES, adhesive tape, and other items for first aid in the workshop can be kept clean in a screw-top glass jar.—*Rosalie W. Doss, El Paso, Texas.*



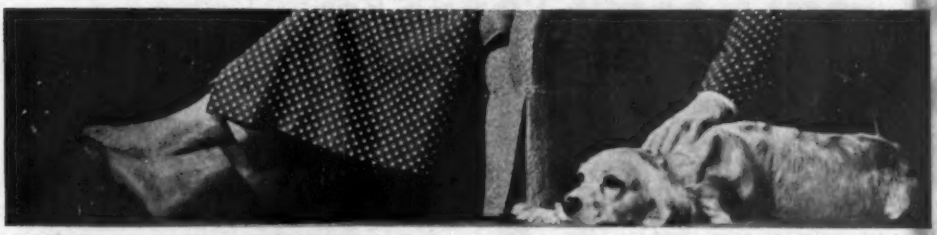
STOP - don't put your poor, protesting feet on that cold floor!

(A PERFECTION HEATER KEEPS FLOORS COMFORTABLY WARM !)

PITY - this poor, cringing soul struggling to re-light his pilot-less heater!

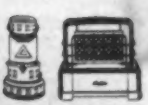
(ECONOMICAL "MIDGET" PILOT IS ALWAYS ON THE JOB !

A PERFECTION EXCLUSIVE !)



ENJOY - the luxurious comfort of all-over, all-the-time warmth - economically!

(PERFECTION "FLOOR-FLO" BLOWER FILLS FARTHEST CORNERS WITH COZINESS !)



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Specialists in GAS and OIL Heating

Does your heater "Measure-up" to Perfection

How to sharpen AUGER BITS

GRIP the bit in a vise, or hold it firmly with one hand at a convenient angle against the edge of the workbench (as shown). In filing the bit cutters, follow the original bevel, removing just enough metal to take any nicks or bruises out of the edge. File only on the top surface of the bit's cutting edge. The lip is filed only on its inside edge.

The file to use. You'll get best results with Nicholson's K. & F. Auger Bit File. It has a double-ended tapered design which permits a narrow file section to be used on the edges of small-diameter bits, and wider sections on the larger bits. One end has its *edges* left "safe" or uncut; the other has its *sides* left safe. Thus one end of the file can be used on bit cutters, the other end on the lip, without damaging the threads of the feed point. Get it through your hardware dealer.

Auger Bit files are only one of hundreds of types of files in which Nicholson superior quality pays off in better results and value. Send for "*File Filosophy*" which tells about kinds, use and care—48 interesting illustrated pages. FREE.

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PLACE DIAMOND TRADE MARK

NICHOLSON FILES *FOR EVERY PURPOSE*

Science Traps the Drunken Driver

[Continued from page 127]

fected are the higher mental activities such as judgment, self-criticism and caution. Next come vision, speech and muscular skills. Last to be interfered with are basic biological functions like heart action, digestion and breathing.

The blunting of self-criticism at the very beginning produces the illusion that alcohol is a stimulant. It's true that the drinker talks more, laughs more and is more sociable. But that's because his mental brakes have been damaged. The machine is actually getting ready to knock itself out.

How Alcohol Slows You Up

One careful investigation brought out the following facts on the depressing effects of approximately one ounce of alcohol:

- Time required to make a decision—9.7 percent longer.
- Time required for muscular reaction—17.4 percent longer.
- Errors made from lack of attention—35.3 percent more.
- Errors made from lack of muscular coordination—59.7 percent more.

Alcohol causes these results because it's absorbed rapidly but is burned up slowly. Five minutes after alcohol has been swallowed some of it can be detected in the blood. At least one hour is required, however, to burn up one ounce of whisky.

The Alcometer Never Forgets

In other words, there are two major factors that determine whether a man is drunk at any given moment: how much he drank, and how long ago. One or two drinks within an hour of a full meal have no significant effect. For anyone taking more than two drinks, however, the meal will not alter the alcohol concentration in the blood.

Anyone tempted to drink before driving should remember how long it takes the body to recover from a given number of drinks. If everyone did, a lot of fatal accidents would never happen. Some people apparently lack the respect for human life that would make them bother to remember. For them the Alcometer stands ready—in court. END

What's in a Pound of Aluminum

PRODUCTION of one pound of aluminum takes four to six pounds of bauxite ore, as well as about 10 kilowatt-hours of electricity and ¾ pound of carbon electrode.

Johnny Lujack SAYS

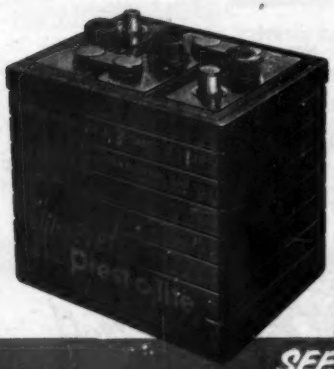
"I add water only 3 times a year"

Johnny Lujack, outstanding passing and running quarterback for the Chicago Bears professional football team, finds Prest-O-Lite Hi-Level has over 3 times the liquid reserve of ordinary batteries—goes 3 times as long without adding water.

PREST-O-LITE HI-LEVEL BATTERY...

needs water only 3 times a year

IN NORMAL CAR USE



INSTALL a Prest-O-Lite Hi-Level Battery in your car and enjoy the comfort and convenience of this new principle of battery design. The Hi-Level Battery needs water only 3 times a year in normal car use and because of its advanced engineering design, it lasts longer, in tests conducted according to accepted life cycle standards. For quick starts and dependable service, see your Prest-O-Lite Dealer.

PREST-O-LITE BATTERY COMPANY, INC.
Toledo 1 Ohio

SEE YOUR PREST-O-LITE DEALER TODAY

World's Biggest Little Railroad

[Continued from page 135]

Most modern railroads are electrified from city terminals to out-of-town engine-interchange points, and Ernest Huebner is now installing an overhead line—called a catenary—for part of the UCON.

Years of Planning Precede Work

Ambitious development plans include two bridges—a swing drawbridge and an elevator lift bridge—and Herbert Ruddock, drafting engineer with Republic Aircraft, has spent two years drawing the plans. Materials for the two jobs will cost about $1,000, and the first one should be completed in about two years. Other projects include a gantry crane—a rectangular metal structure mounted on wheels that straddles two tracks—a grain pier, a coal pier, an ocean-liner pier, tugboats and barges.

Simon-pure railroaders are chiefly interested in rolling stock, track system and control equipment, but scenery adds realism and visitors love it. UCON's greatest scenic triumph is the model of the Delaware Water Gap—the work of Manville Wakefield, an art instructor at Pratt Institute in Brooklyn. As a train rounds the bend of the deep valley, the rocky profile of Chief Tammany can be seen at the exact spot where it is regularly seen by passengers on the real Lackawanna Railroad.

How Mountains Are Made

Special techniques and materials are used in creating rural scenery over the great waist-high framework on which the UCON is mounted. First, wood frames are erected, roughly formed to the contours of the desired hills, valleys and plains. The frames are covered with heavy wire screening, and this, in turn, is covered with plaster composed of asbestos and Portland cement. When dry, the surface is painted, and grass is made by sifting green rayon fibers 1/16 inch long onto the wet paint. Then, by tapping the bottom of the frame, the grass is made to stand up straight. By different methods of application, you can get the effect of a mowed lawn or a field

[Continued on page 236]

UNCLE WALTER

IT SMELLS GRAND

TAKE ONE WHIFF!
(FOR THIS YOU'VE YEARNED!)

IT PACKS RIGHT

PACK YOUR PIPE—
NOW YOU HAVE EARNED

IT SMOKES SWEET

—HAPPINESS FOR ALL CONCERNED!
—with Sir Walter Raleigh!

IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE, AND SIR WALTER RALEIGH NEVER LEAVES A SOGGY HEEL IN YOUR PIPE. STAYS LIT TO THE LAST PUFF.

It costs no more to get the best!

Now a Kentile Floor for Only $17.75*

for a 7' 6" x 9' room

IT'S SO EASY TO INSTALL GUARANTEED KENTILE YOURSELF... AND SAVE MONEY

Here's the floor anyone can *lay* — and thousands are doing it! Kentile is precison-cut to go down tile by tile, quickly and simply over any smooth, firm underfloor.

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GUARANTEE

FOR SELF-INSTALLED KENTILE

Kentile, Inc. will provide new tile without charge for any Kentile that wears out and on which colors wear off during your own occupancy of your home wherein you have installed Kentile. This guarantee does not apply to damage caused by improper handling, or failure to follow the instructions for installation and maintenance available at your Kentile dealer's.

*Price quoted is for a 7' 6" x 9' Kentile Floor installed by you. Your Kentile Floor may cost you less or slightly more depending on size of room, colors selected and freight rates.

Low-Priced Kentile Floors are *Guaranteed*... and only your Kentile Dealer can make this Offer!

KENTILE resists dirt and stain . . . colors are *guaranteed* not to wear off. Mild soap and water cleanings preserve the beauty of a Kentile Floor and an occasional no-rub waxing keeps it colorfully bright and fresh as new.

Look under FLOORS in the classified pages of your local phone directory. In Canada—at T. Eaton Co., Ltd. FREE estimate will show you how surprisingly little Kentile costs.

KENTILE.

The Asphalt Tile of Enduring Beauty

KENTILE INC., 58 Second Ave., Dept. H-3, Brooklyn 15, N. Y.

NOW A TRULY LOW COST QUALITY BUILT SAW!

Only $33.95!

Less Motor. Table extensions $4.95 pair.

Atlas WORKSHOP TOOLS

8" SAW

SAVES YOU MONEY

on SHELVES, CUPBOARDS, REPAIRS, FURNITURE

Join the millions of men who are really saving money this year building things for their homes—and having fun as well. This Atlas Workshop saw is the basic tool you need. You can't touch its value at the price!

Precision-ground grey-iron table gives you 12¼" x 16" working surface. 8" blade cuts 2½" deep—table tilts for all angles up to 45°. Steel fence is 14" long. Guard, splitter, and motor rail furnished. You've never seen a saw like this at such a price. Ask your Atlas Workshop dealer, or send coupon.

SEND FOR FREE CATALOG

Please send your Workshop tool catalog, showing all 5 tools, and operating views.

Name_____

Street_____

City, State_____

40TH YEAR Atlas

ATLAS PRESS COMPANY

955-W Pitcher Street, Kalamazoo, Michigan

World's Biggest Little Railroad

[*Continued from page 234*]

of tall grass. Shrubbery is made from Norway lichen. To make a tree, you start with a wood or metal trunk, make branches with wire and apply lichen for foliage.

Construction of the big little railroad followed a master plan, adopted after a series of spirited meetings. Dozens of plans were proposed and discussed. All but eight were eliminated, and from these a final plan emerged that won the necessary votes.

Members Trained for Jobs

There is now a foreman for each department of the project. He makes sure that the master plan is followed and that all work is up to standard. To join the society, a man must be at least 21, have a mature interest in model building and be willing to put in a certain amount of time. Once a prospective member had to show a model; now, if the committee is convinced that an applicant means business, he is taken in and trained. After a decent interval, he puts on the visored railroad cap that the seasoned members like to wear.

A member may start in as brakeman, coupling and uncoupling cars when told to. He may work his way up to conductor, taking a test to get his rating. To become operator on a switch tower, he must study the section and know all track rules. After he has checked out on all switch towers, he can run the railroad and is eligible for further training as dispatcher.

Distinctions Left at the Door

Whenever there is a wreck, a serious investigation follows, and if it was caused by poor operation, "brownies" (the railroad term for demerits) are meted out to the culprit.

Many occupations and income levels are represented. There are doctors, lawyers, brokers, engineers, mechanics, salesmen, clergymen, jewelers, advertising men, shop keepers, sign painters and one psychiatrist, who might come in handy, says President George Brackmann, since some people think model railroaders are crazy. "Whoever a man is," Mr. Brackman adds, "before he comes in the door he checks his position, income bracket, race, religion and politics."

The UCON RR has a small rival, the Union, Hoboken and Overland, which is about a year old. The U.H.&O., an "HO"

[*Continued on page 238*]

It's *Safer* to Drive a Quick Responsive Car—

Get Dependable

CHAMPION

Spark Plugs

For Powerful Acceleration!

BE A CHAMPION DRIVER ... *Regular Spark Plug Service Insures Greater Driving Safety!*

Gradual erosion of electrodes will alter gap settings, resulting in unresponsive engine performance —noticeable most when you need peak performance most.

Keep plugs efficient! Let your Champion dealer check and clean them every three or four thousand miles. It results in longer plug life, better performance and economy.

There's a positive safety factor in powerful acceleration—impossible without good spark plugs. That's why nearly all racing champions and airlines use Champions.

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

Listen to the CHAMPION ROLL CALL ... Harry Wismer's fast sportscast every Friday night, over the ABC network

World's Biggest Little Railroad
[*Continued from page 236*]

system—3.5 mm. to the foot—occupies a space of 20 feet by 12 feet in the same hall, and attracts a number of members who like to work in the smaller gauge. There is also an "O" gauge trolley line, with its own group of aficionados, which feeds the UCON system. The society also has groups that work on model planes, automobiles, boats and other objects.

It's a $2,500,000 Concern

Last winter the society celebrated its Silver Anniversary with an exhibition that attracted 25,000 customers. During the show, the rolling stock alone was insured for $200,000, but that is only a fraction of its replacement cost. Members estimate that every foot of finished track, from the bare floor to the finished roadbed, including scenery, buildings, etc., takes about 100 man-hours of skilled labor, without including rolling stock. Building one of the better model locomotives may take 2,000 man-hours, and if you hired a good man for the job, the cost might be $6,000 in labor alone. If club members got the same pay that they get on their jobs, and if they bought materials on the open market instead of shopping around in secondhand and junk shops, the road and rolling stock might easily represent an outlay of $2,500,000.

How to Run a Railroad

Model Railroader magazine reports that there are between 300 and 350 such clubs in the United States, with an approximate average membership of 15 to 20. While accurate figures are hard to get, the magazine believes that scale-model railroad workers (exclusive of toy-train owners) have increased about five-fold since the war. Its surveys show that the average fan is a married man over thirty, has graduated from high school or college, is a professional man, an executive or a skilled tradesman, and earns $4,118 a year.

During the war an officer of the Army Transportation Corps wrote to the famous New York Society, asking for a list of competent model railroaders who might be interested in handling military rail traffic. "They may not be able to handle special full-scale jobs," he explained, "but *they know how to run a railroad.*" END

See PS next month for a story on one of the biggest live-steam model railroads.

The POPULAR Line of Portable Power Tools

PET TOOLS

For Better Work... Easier and Quicker

Have Hundreds of Uses Around the Home In the Shop • On the Farm

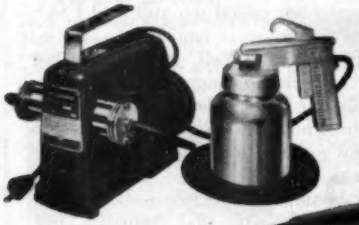
Embodied in every PET portable electric tool and accessory is the excellence and value developed through advanced engineering, modern streamline design, economical manufacturing methods, and the specialization in high-quality electric tools. Each represents the finest precision workmanship and quality features that contribute to dependable performance, trouble-free service, and a new balance and ease in tool handling. The various accessories available for use with PET portable electric tools have been tested and proved in the applications recommended. They conveniently extend the use of this portable power to a variety of jobs that make for easier and better work around the home, in the shop, and on the farm.

You can buy a PET portable electric tool from your dealer with the full confidence of getting the ultimate in the combination of economy, power, light weight, balance, operating convenience, and long life of trouble-free service. Use coupon for complete details.

ZEPHYR

¼" Drill

Full ¼" Capacity
Lock-Type
Trigger Switch
Palm Grip
Price $17.95



ZEPHYR

½" Drill

Streamline Design
Removable Side Handle.
Price $31.15

ZEPHYR

Spraymaster Portable Spray Outfit

For Paint, Lacquer, Enamels, Mothproofing Solutions, Etc.
Price $24.95

ZEPHYR

Electric Hand Saw

Maximum Depth of Cut 2⅛". Adjustable for Depth and Angle of Cut. **Price $41.95**

***HI-POWER* Bench Grinder**

4" Diameter Wheels, 3500 RPM.
Price $18.95

PET TOOLS

At Hardware, Implement, and Building Materials Dealers, and Department Stores —Or Write Direct

PORTABLE ELECTRIC TOOLS, INC.

326 West 83rd St., Chicago 20, Ill.

In Canada: Portable Electric Tools, Ltd., 369 Danforth Road, Toronto 13, Ontario.

Portable Electric Tools, Inc.
326 West 83rd Street, Chicago 20, Illinois

Please send me your new PET tool catalog and name of nearest dealer.

*Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

Send Coupon Today for Full Information

You, too, can own AMERICA'S FINEST BASIC WRENCH SET!

*Snap-on "MASTER SUPREME SET"

"THE CHOICE OF BETTER MECHANICS"—*Everywhere!*

Here is the wrench set for you who like fine tools . . . and *know the difference* they make in speed, workmanship, safety! Here, in a handsome steel case, is a full set of the *most needed* wrenches for general work, based on the repeated selections of experienced mechanics everywhere. Four handles, including a ratchet and speeder—3 extensions—a universal joint—and 15 most often-used sockets. All genuine *Snap-ons* . . . the *last word* in fine tool quality!

The Master Supreme set is the perfect foundation for any tool kit! Never sold in stores . . . you buy direct from factory (or from Snap-on factory branch in larger cities). Full information on this set, and thousands of other tools, in free Snap-on catalog. Write for it today!

SNAP-ON TOOLS CORPORATION
8060-I 28th Ave., Kenosha, Wis.

*Snap-on is the trademark of Snap-on Tools Corporation.

Are You Ignoring a $1,000,000 Idea?
[*Continued from page 144*]

large volume plus a modest profit margin is the key to success in American free enterprise was nailed down for good in 1928, when he went to Dearborn to study the formula under the original Henry Ford.

"Mr. Ford believed in making what Americans needed, at prices they could afford to pay," he reminisces. "He felt that anything that could make life pleasanter should be cheap enough to make *everyone's* life pleasanter." Magnus' blue eyes flash and he describes an eloquent arc with his powerful but sensitive hands. "That is what makes this country unique: the good things are not just for the few."

Why He Left Europe

In Copenhagen he had been a clerk in a big insurance company. "My duties began with taking the mail to the Herr Direktor-Herr Chairman-Herr Stockholder—all one man—bowing to him, greeting him, inquiring after his health, placing the letters on his desk just so, bowing again and retiring," he recalls. "I thought I was doing well by him, but my supervisor called me and said I was letting him down.

"'How?' I asked. 'Well,' he said, ticking the points off on his fingers, 'you address him by only one of his titles, you omit to ask after the health of his aged mother, you do not bow low enough and you do not arrange the letters as he likes.'

"I went home and told my mother I was through—not only with that company, but with Europe."

His first job in America was washing dishes. After that came a spot of stevedoring, turns as a sander and machine operator, various other skilled industrial jobs, the tour with Ford, three years with National Cash Register, and then the Button Corporation of America, where in nine years he rose from machine operator to general manager.

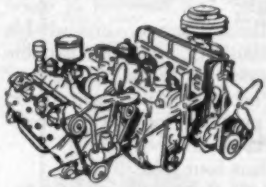
The Opportunity He Saw

It was there that he got acquainted with plastics. And whenever Finn Magnus encounters a new (to him) material or machine or concept, his brain gives off sparks. The first day with BCA, he began thinking up schemes for making things out of plastics. By 1943, he must have accumulated a hundred.

One evening he dropped into a Newark

[*Continued on page 242*]

"New-Engine" Your Car Now With A Wizard-ized® Engine for $16 Down

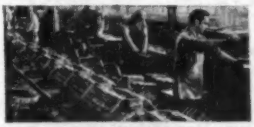


FORD	PLYMOUTH	CHEVROLET
as low as	as low as	as low as
$16.00 Down	$17.00 Down	$14.00 Down

Terms vary by area, make, and model of car.

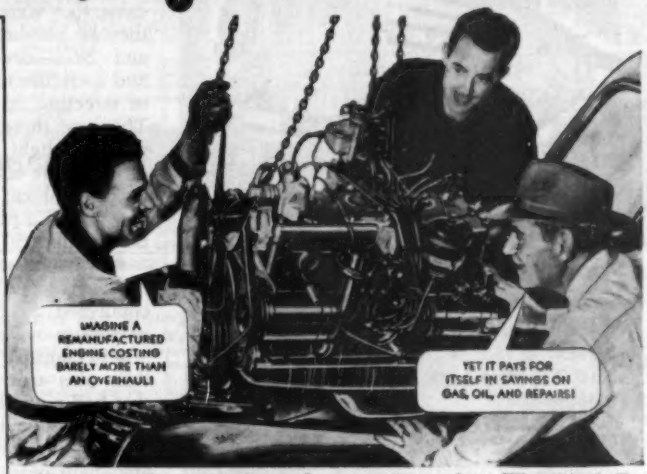
The Biggest Money-Saving Idea In Car Maintenance In Over 20 Years!

Now you can say goodbye to high upkeep costs and never-ending repair bills . . . enjoy new car power with a Wizard-ized Engine.



Not just "rebuilt"—but fully remanufactured in 5 large factories. Every original manufacturing step repeated, using original factory block. Backed by over 3000 Western Auto Stores and Associate Stores!

Every moving part brand new top quality, or completely remanufactured to function like new. That's why you can buy a Wizard-ized Engine with new car confidence.



***Your easy, low-cost solution** for "tired" Chevrolets, Fords, Plymouths, Pontiacs, Mercurys, Dodges, Chryslers, DeSotos, Oldsmobiles, Studebakers, and other popular makes. Wizard-ized Engines are fully remanufactured in 5 large factories. Engine accessories used from your old engine, or may be replaced new.

Get Another 50,000 Miles or More from Your Car With A WIZARD-IZED ENGINE THAT Pays for Itself!

Thousands have discovered this easy new way to stop constant costly engine repair bills—simply by replacing their old engine with a low-cost guaranteed Wizard-ized Engine . . .

No other engine—no overhaul—can give you more miles for so little cost. And, you get . . .

The same engine guarantee that comes with a new car—plus free 500-mile service check of our installation. Each Wizard-ized Engine gets a . . .

Complete factory inspection and then a final test-run. Our installations are made by trained mechanics in fully equipped garages. You can buy a Western Auto Wizard-ized Engine with new car confidence! And, best of all, it's . . .

Priced far below a new engine . . . or about the same as a bearing, ring and rebore overhaul.

Why waste money on extra gas, oil, and repairs for a worn-out engine? You can enjoy a Wizard-ized Engine for . . .

Less than ½¢ per mile . . . and you get years of new miles without the high cost of a new car!

See your Western Auto man now . . . about his guaranteed trade-in allowance for your old engine!

EASY TERMS AS LOW AS $3.00 weekly
(Terms vary by area, make, and model of car.)

Wizard-ized® Engines

FACTORY REMANUFACTURED*

Sold Only By WESTERN AUTO STORES & ASSOCIATE STORES

The Engine You Can Buy with New Car Confidence!

The Finish Is The Thing That Counts!

Don't buy ANY sander until you've tried new SYNCRO No. 504. Its *Double Arc Motion* gives Double Sanding Action and combines BEST features of orbital and straight-line sanding for a silky finish. Perfect for polishing, too. With new BUILT-IN Reactance Type Electric Motor, **$19.95.**

SYNCRO QUALITY TOOLS SANDER

U.S.A. Model No. 504, 60 Cycle, 110-120 Volt AC. Other Cycles, Voltages available. Dealers, Jobbers, write!

USE COUPON FOR CIRCULAR OR DIRECT ORDER

SYNCRO, INC., DEPT. G-91, OXFORD, MICHIGAN, U.S.A.

☐ ORDER. I enclose **$19.95.** Send No. 504 Sander postpaid on a 10 Day Money Back Trial.

☐ FREE CIRCULAR. Send new SYNCRO CIRCULAR showing new SAW and new SANDER.

WRITE NAME, ADDRESS BELOW—MAIL TODAY!

Are You Ignoring a $1,000,000 Idea?
[*Continued from page 240*]

toy store to buy a harmonica for his two-year-old son. The surprising news that the store had not seen one in three years pushed everything else into the background.

Why should all the harmonicas come from Germany and Japan anyway? And why should they cost so much, when kids were the ones who bought them? Probably because they were handmade. But why should they be handmade? And why out of wood and brass—needlessly heavy, unwashable and therefore unsanitary, and quite capable of infecting or even cutting a child's lips? Then and there, he began to concentrate on a cheap, light, sanitary, long-lasting, one-piece plastic harmonica.

The problem was four-fold:

- to find a plastic that would make satisfactory musical sounds;
- to conceive a reed-plate that could be molded as one unit, with reeds integrally connected to the plate, and that would emerge in one piece, fully in tune;
- to conceive a mold that would produce this, plus free-vibrating parts (something that had never been attempted); and
- to change existing standards for plastic-molding machines, which had never come anywhere near the .0001-inch tolerance he had in mind.

Three Years in the Basement

Magnus went to work in his home basement lab. Originally he planned to devote a few hours, a few hundred dollars to the task. (He stuck to the Button Corporation job: Finn Magnus is not the sort to let go of the bird in hand before getting hold of a few tail feathers of the one in the bush.) But soon he found himself toiling mornings, noon hours, evenings, week ends and holidays.

The first mold broke. Some weeks (and several hundred tries) later, it turned out a reed-plate with four of the 10 reeds in tune. Magnus kept plugging, often until the first streaks of sunlight warned him it was time to swig some coffee and hop to the button plant. At last, six reeds came out right. Then eight. Then a slip back to seven. And finally, 10 out of 10, 10 times out of 10.

It had taken three patient, plodding years. Unfortunately, his bank balance had not been as inexhaustible as his energy and faith: it was gone with the wind instrument. So, he trotted across the Hudson to

[*Continued on page 244*]

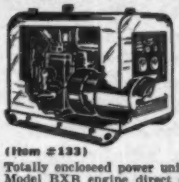
GROBAN'S BRAND NEW

WAR SURPLUS BARGAINS

ALL FULLY GUARANTEED

IMMEDIATE DELIVERY—LARGE STOCK—MANY SIZES

GENERATING PLANTS



(Item #133)

3 KW—120 Volts—60 Cycle Single Phase

ALTERNATING CURRENT

HEAVY DUTY—DESIGNED FOR CONTINUOUS OR INTERMITTENT SERVICE

PLENTY OF CURRENT TO OPERATE YOUR— • OIL BURNER • REFRIGERATOR • HOME FREEZER • SUMP PUMP • POWER SAW • BROODER • CREAM SEPARATOR • INCUBATOR • VENTILATING FANS • MILKING MACHINES • BLOWERS • YARD LIGHTING • OTHER APPLIANCES

Totally enclosed power unit with 2 cylinder water-cooled Hercules Model BXB engine direct coupled to generator. Magneto ignition, crank start, 4 gallon gas tank, 3 qt. oil capacity. Skid mounted with handrails for carrying. Instrument panel including killer button, oil pressure, water temp. gauges, voltmeter, ammeter. Shipping wt. 560 lbs. F.O.B. Chicago.

395.00

Item #133

(Item #88)

Write for information on other size generating plants ranging from 600 watts to 25 KW.

(Item #96)

Vickers HYDRAULIC PUMP

(Item #39)

Piston Type. Ideal for use with hydraulic cylinders and valves described in this page ad. Vickers constant displacement piston type pump delivers .507 cubic inches per revolution, 5 gallons per minute at 2750 RPM, 1000 PSI. Has ½" diam. shaft, ⅜"-18 thread inlet and outlet ports. Rotation—clockwise. Ppd. **19.90**

HYDRAULIC CONTROL VALVE

(Item #26)

Four-way control valve for use with two hydraulic double-action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Ship. wt. 6 lbs. A $60.00 value. postpaid **12.95**

Byron-Jackson "PUP" CENTRIFUGAL PUMP UNIT

$3800.00 Value

COMPLETE WITH FULL ENGINE AND PUMP INSTRUCTIONS

2 STAGE MODEL "PUP" PUMP DRIVEN BY AN 8 CYLINDER MODEL C-36 CHRYSLER INDUSTRIAL ENGINE. ENGINE SPEED 2400 RPM—100 H.P.

600 GPM AT 175 PSI—PARALLEL CONNECTION

300 GPM AT 375 PSI—SERIES CONNECTION

(Item #132)

IDEAL FOR: Pick-up, Gathering, Fire Fighting, Salt Water Disposal, Sprinklers, Irrigation, Dewatering, Construction, etc.

These skid-mounted Pumping Units are standard production models with parts and service readily available. Designed for a wide range of operating conditions particularly where wide variation in head and capacity are required. Twin suction and discharge ports are cast on the same side and so arranged that external piping is interchangeable for either parallel or series pumping applications. Overall dimensions, 114" L x 29" W x 62" H. Weight 2480 lbs. Now, complete with operating instructions and performance data. F.O.B. Chicago **1495.00**

BRAND NEW

GENERAL MOTORS — ALLISON CENTRIFUGAL PUMP

(Item #130)

200 GALLONS PER MINUTE

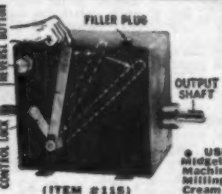
• For Draining Basements • Fire-Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering

This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2½" standard pipe thread, twin outlets with 1¼" pipe thread, ball bearing supported ¾" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 25 lbs. Gov't acq. cost $145.00.

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	50'	40	1.8	2500
10'	40'	140	5.0	3500
10'	30'	100	3.0	2500

Now Only **39.50** F.O.B. Chicago

HYDRAULIC SPEED REDUCER with FINGERTIP CONTROL



(ITEM #115)

• USE FOR: Reamer Drives • Midget Cars • Feed Mills • Ceramics Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds ranging from 0 to input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain the setting. Internal relief valves prevent overloading. Use input power of ¼ to 1½ H.P.

This Westinghouse-Oil Gear Unit converted to commercial use from an AM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finish steel oil reservoir (capacity 3 qts.). Adjustable relief valves set at factory for 180 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7½"x7½"x11½". Gov't acquisition cost, $425.00. Shipping weight 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

D.C. GENERATORS

For welders, plating, truck and marine use, D. C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty.

Item #131—Brand new Electric Auto-Lite 12 volt Direct Current electric generators, rated 18 amps. Complete with blower and pulley. Use for trucks, tractors, boats, battery chargers, etc. Part No. GEF-4805A. In original sealed U. S. Army cartons. $40.00 value. Shpg. wt. 27 lbs. F.O.B. Chicago. Now Only **15.00**

Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost $300.00. Shpg. wt. 53 lbs. F.O.B. Chicago **22.50**

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't. Acq. Cost $380.00. Shpg. wt. 50 lbs. F.O.B. Chicago. Each individually packed in wooden box **35.00**

AIRCRAFT QUALITY HYDRAULIC CYLINDERS

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #70—Purolator hydraulic oil filter. Permanent element type. ⅜" female pipe thread ports. Capacity 18 gallons per minute. A $13.00 value, now **postpaid** **4.95**

ITEM #4—All steel double action hydraulic cylinder, 1⅛" bore, 2⅞" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. **Postpaid** **4.95**

ITEM #127—Double acting hydraulic cylinder, 1" bore, 1" stroke, ½" diam. shaft, ⅜" tubing thread ports. Over-all length closed—6½". Clevis mounting at both ends. Perfect for clamping and feeding. **Postpaid** **5.95**

ITEM #33C—Double action hydraulic cylinder, 1½" bore, 4½" stroke. Clevis mountings at both ends. Uses ¼" pipe fittings. **Postpaid** **8.95**

(Item #42)

ITEM #16C—Double acting hydraulic cylinder, 1½" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A $55.00 value. Now Only. **Postpaid** **16.95**

ITEM #103—Double acting hydraulic cylinder, 2½" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1¼" diam. shaft, ⅝" tubing thread ports. Overall length closed 28". Shpg. wt. 11 lbs. F.O.B. Chicago **21.50**

ITEM #31C—Double action hydraulic cylinder, 3½" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1⅛" piston rod. Clevis mounting at base and shaft. 19½" overall length closed. Will lift 9625 lbs. using 1000 PSI from Logan Heavy Duty Hydraulic Pump. Uses ⅝" tubing fittings. Value $102.00. Shipping wt. 11 lbs. F.O.B. Chicago **22.50**

ITEM #6—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel, 1⅛" stainless steel shaft. Gov't acq. cost $176.00. Ship. wt. 30 lbs. F.O.B. Chicago **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,560 lbs. Ship wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for **32.50**

FREE: NEW 48-PAGE CATALOG chuck-full of unsurpassed War Surplus Bargains for the farm, home, factory and workshop at far-below-cost prices.

ORDER DIRECT FROM AD — SEND PAYMENT OR PURCHASE ORDER TODAY — SATISFACTION GUARANTEED

GROBAN SUPPLY CO. 1139 SO. WABASH AVE., CHICAGO 5, ILL. DEPT. PS-9

New PORTER-CABLE Guild ORBITAL SANDER

At last a POWERFUL Motor-Driven FINISHING SANDER

MODEL 106

AT A PRICE EVERY MAN CAN AFFORD ONLY . . . $49.50

IDEAL FOR FURNITURE, BUILT-INS, INLAY WORK
Leaves no fur — provides smooth, flat surfaces having a professional look.

NOW — a radically new orbital sander that produces a fine piano finish — even better than hand sanding! And 10 times faster! Abrasive pad travels at high speed in 1/4" orbit. Grits move in overlapping circles in all directions — with, against, across the grain. Therefore, no tendency to dig or burn . . . can't track. *Doesn't gouge.* Regardless of direction of grain — or variations in wood density — Guild 106 makes the surface smooth, even, uniform. *Won't ripple.*

LEVELS GLUED, BUTT, MITER JOINTS
Can't be surpassed for blending spots where opposing grains or different woods meet.

NEW FROM TOP TO BOTTOM
Powerful AC-DC motor — *not* a vibrator. 4,000 RPM *under load.* Gearless drive — assures trouble-free operation. Dust-free air intake. Patented paper clamp pulls 1/3 of standard 9" x 11" sheet smooth and tight. Weighs only 6 lbs.

CHAMFERS EDGES; FITS FRAMES
Ideal for sash, screens, doors. Smooths plywood without chipping.

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Test the new Guild 106. *Prove* its better finishing, yourself! For name of nearest dealer and all the facts, mail coupon below.

PORTER-CABLE MACHINE CO.
6089 N. Salina St., Syracuse 8, N. Y.

Send me complete description and uses of Guild 106 Orbital Sander . . . also name of nearest Guild dealer.

Name.....

Street.....

City.....Zone.....State.....

Manufacturers of SPEEDMATIC and GUILD Electric Tools
In Canada write Strongridge, Ltd., St. Catharines, Ont.

Are You Ignoring a $1,000,000 Idea?

[*Continued from page 242*]

Wall Street. Banker after banker shook his head. Harmonicas? The fellow must be crazy!

But Finn Magnus knew the jobbers were hungry for harmonicas. He took full-page ads in the musical trade press, inviting orders for delivery by such-and-such a date. A shower of checks totaling $250,000 buried him. He sent back all but three adding up to $35,000, then made a deal with the signers of those three to give them preferential treatment in return for a temporary "loan."

Of course, the problems—and the long, sleepless nights spent in solving them—continued. Lawyers bobbed up with "patent-infringement" beefs, but Magnus had thoughtfully included a couple of able attorneys in his board of directors.

He Makes 3,600 an Hour Now

A Magnus-designed assembly machine now turns out harmonicas at a 3,600-an-hour clip. And nearly 500 employees are kept busy around the clock in three shifts.

The number of foreign countries to which the company exports is down now from 67 to 22, chiefly because of currency exchange bottlenecks. (The last shipment to China included 185,000 harmonicas.) But the warehouses in Newark, Chicago and San Francisco soon will be bulging with new products. To begin with, a larger electric organ. Then a whole line of professional musical wind instruments. And then this bouncy businessman expects to turn his attention to 23 other inventions. One is designed to do away with all forms of embossing—indeed, of superimposing of any kind.

Magnus Still Haunts Workshop

The other evening Magnus had to wait while his wife did her nails. When they returned from dining out, he slipped down to his workshop, peeled off his coat and whipped up a gadget that will paint any size fingernail five at a clip, in four seconds.

Small wonder Finn Haakon Magnus was one of the four 1951 Horatio Alger Award winners selected by the American Schools and Colleges Association—as well as this year's choice of the Newark Unico Club as the outstanding "adopted son" of the city.

"This is a wonderful country," Magnus sighs. "It is the one place in the world where the only thing that can keep a man down is himself." END

SURPLUS MACHINE SHOP TOOLS AT PRICES YOU CAN AFFORD

DRILL BIT MIX

Over 300 pcs. (2 lbs.) of used High Speed Drill Bits up to ¼". Some require sharpening. Ideal for pin punches, drift pins, etc. Less than 1c ea. at..... **$2.98**

HIGH SPEED STRAIGHT SHANK DRILLS

SET 7S 10 Different Size H.S. Straight Shank Jobber Length Drills, ¼" to ½". (shank same dia. as drill) $25 Value, only..... **$3.95**

HIGH SPEED DRILLS

¼" to ½" with ¼" Shanks
½" to 1" with ½" Shanks

SET 35S 8 Different Size H.S. Drills, ¼" to ½" all with ¼" shanks..... **$3.50**

SET 36S 10 of above **$4.95**
Set 3R and 4R will fit any ¼" drill.

SET 32S 5 Different Size H.S. Drills, ½" to 1" with ½" shanks **$6.95**

SET 33S 10 Different Size H.S. Drills, ½" to 1" with ½" shanks **$12.95**

These H.S. precision drills with ½" shanks can be used in a ½" electric drill or a ½" capacity lathe or drill press.

HIGH SPEED MORSE TAPER SHANK DRILLS

SET 10S 20 Different Size High Speed Morse Taper Shank Drills from ¼" to 1". $70 Value. Priced at only..... **$12.95**

SET 15S 10 Different Size High Speed Morse Taper Shank Drills from ½" to 1¼". $50 Value. Priced at only..... **$9.95**

SET 37S 5 Different Size High Speed Morse Taper Shank Drills from 1" to 2" with No. 3, 4, and 5 taper. $125 Value. Priced at only **$29.95**

HIGH SPEED HAND TAPS

SET 1S 8 Different Size High Speed Standard Thread Hand Taps up to ¾" including 2 std. High Speed Pipe Taps..... **$2.95**

HIGH SPEED TAPER SHANK CHUCKING REAMERS

SET 25S 15 Different Size High Speed Morse Taper Shank Chucking Reamers up to ½" with No. 1 and 2 tapers. Priced at only **$6.95**

SET 13S 8 Different Size High Speed Morse Taper Shank Chucking Reamers from ¼" to 1". Priced at only..... **$4.95**

SET 12S 10 Different Size High Speed Morse Taper Shank Chucking Reamers from ½" to 1½". $65.00 value. Priced at only **$9.95**

HIGH SPEED STRAIGHT SHANK CHUCKING REAMERS

SET 16S 20 Different Size High Speed Straight Shank Chucking Reamers up to ½". Priced at only..... **$7.95**

SET 17S 10 Different Size High Speed Straight Shank Chucking Reamers from ½" to 1¼". Priced at only..... **$9.95**

SET 18S 15 Different Size High Speed Straight Shank Chucking Reamers from ¼" to 1". Priced at only... **$6.95**

6 Slitting Saws with Mandrel

SET 34S 6 Different Size High Speed Slitting Saws, 2¾" dia. x 1" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in ¼" or ½" elec. drill. $25 Value. Only..... **$4.95**

HIGH SPEED WOODRUFF KEY SEAT CUTTER

SET 4S 5 Different Size Cutters. Can be used as mounted milling cutter or circular saw. All with ½" shanks, widths up to ¼", diameters up to 1½". Priced at only **$3.95**

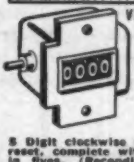
NEW HIGH SPEED COMBINATION DRILL AND COUNTERSINKS

SET 2S 8 selected sizes from C2 to F2 (1/16 drill x 13/64 body to 3/16 drill x 7/16 body) 60 degree angle of countersink. New cost on these countersinks 75c to $2.50 when available. Your price for set of 8. only **$4.95**

½" DRILL GRINDING WHEEL KIT

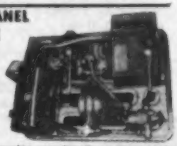
10 First Quality, ½" arbor Grinding Wheels, all grits and sizes from ⅝" to 1¼" dia. and ⅛" to 1½" thick, all which fit machined mandrel pictured. Mandrel will fit any ½" stone you now have. 10 stones plus mandrel, only..... **$1.95**
20 stones as above, plus mandrel..... **$3.79**

VEEDER ROOT COUNTERS



3 Digit clockwise rotation type (new) **$1.49**
4 Digit clockwise rotation type (new) **$1.89**
5 Digit clockwise rotation type (Reconditioned). **$2.89**
5 Digit ratchet type (Reconditioned) **$2.49**
5 Digit clockwise rotation type with key reset, complete with key, counts in fives. (Reconditioned) **$2.75**
5 Digit ratchet type, with key reset complete with key, counts in singles. New cost about $17.00 when available. (Reconditioned) Only **$3.49**
All Counters Guaranteed Against Mechanical Defects.

HYDRAULIC PANEL COMPLETE ONLY $54.95 F.O.B. Tulsa



A complete hydraulic mechanism, compactly mounted, connected, ready to go! Includes: 2¼ H.P. 4000 RPM, 90 Amp., 24 volt, precision built, ball-bearing throughout electric motor, attached to 1000 PSI, 6 GPM, Pesco or Vickers Pump; one 4-way Vickers Hydraulic Valve; one Vickers Unloading Type Relief Valve; one 1000 PSI Accumulator; one Cuno Oil Filter; one 2-gal. Hydraulic Tank with Visual Gauge; Plus Dozens of fittings and connections. Government cost over $300. Shipping Wt. 75 lbs. Limited Quantity.

Money-Back Guarantee—All Misc. Mixture of New and Reconditioned Tools Unless Specified Brand New—All Orders (Except Those Specified F.O.B. Tulsa) Are Shipped Post Paid, saving you up to 25% on total delivered cost.

Write for Free Catalog Describing Thousands of Bargain Cutting Tools.

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Truly, Cushman EAGLE is the new sensation in its field. It operates for only ¾¢ per mile, cruises to 50 m.p.h., gets over 75 miles per gallon. Dealer inquiries invited.

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DYNAMIC SUPER-CHARGED ARC-WELDER

DOES WELDING, BRAZING, SOLDERING, CUTTING

It's the finest, precision built heavy duty transformer-welder available for home, farm, or shop use. Does work you'd expect from costlier machines. EASY TO OPERATE. Do expert work; follow simple instructions. Works on iron, steel, brass, bronze, aluminum and other metals. Operates from any properly wired 110 volt 50/60 cycle AC line. Save time, Make money—Build or repair auto, home, farm or shop equipment, etc. for yourself and others in spare or full time. Comes complete Ready-To-Operate. Order today for 10 day trial on money back guarantee or write for Free Particulars.

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Dozens of new ways to use your Home-Utility Tools! Plenty of new jobs you can do around the house and in your shop! They're all yours when you buy Home-Utility accessories like those shown below. Try them at your hardware, electrical, implement or department store!

PLUS auger bits, masonry bits, countersinks, twist drills, chucks, arbors, abrasive kit, buffing and polishing kit.

Products of HOME-UTILITY Div., BLACK & DECKER Mfg. Co., Dept. H95, Towson 4, Maryland

ELECTRIC HOME-UTILITY TOOLS

¼"-½" DRILLS • SANDER-POLISHERS • 6"-8" LECTRO-SAWS

Somebody's Blood May Save Your Life

[Continued from page 148]

whole blood, and is practically as good. In some cases—burns, for example, where much liquid but few cells are needed—plasma may serve better than whole blood. Another advantage is that everybody's plasma is much the same—it can be transfused without worrying about blood types.

But the best thing about plasma is that it keeps a long time. After freezing and vacuum-drying, it lasts at least five years.

Plasma itself can be processed to get the chemicals it contains, all useful in research and some useful in treating disease, by methods developed by Dr. Edwin J. Cohn, Harvard's famous blood chemist.

Ingredient in Plasma Gives Immunity

Of these, only the one called gamma globulin is widely used. It is a good treatment against measles. It may also protect against other diseases. The researchers think this blood fraction has concentrated in it all the different antibodies that protect you against all the different diseases you've ever had. Theoretically, then, mixed gamma globulin from many people should immunize against all common diseases. Nearly everybody has had measles, and gamma globulin does immunize against measles. Nearly everybody has also had a mild polio attack, and so gamma globulin may work against that, too.

Although nothing can replace whole blood, there are a couple of substitutes for plasma. One, called serum albumin, is made from plasma itself. Another, called globin, is made from the chemical that colors red cells.

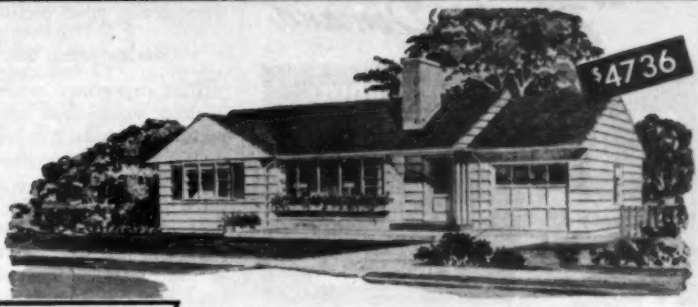
Still another is SPPS—stable plasma protein solution. This can be prepared by an automatic machine, developed by Dr. Cohn, that takes blood directly from a donor, extracts some of the useful ingredients, and leaves the rest as SPPS. SPPS has several advantages—it promises to work better than ordinary plasma, and it keeps well.

Even factory-made synthetics—PVP (PS, July '51, p. 94) and Dextran, for example—can double for plasma.

But the thing you'll probably need most if you're hurt or sick has no substitute. There's none in sight. Only human beings can make and give whole blood. "Give" is literally true. The Red Cross doesn't charge for the blood it supplies. And the person who donated it gets only a cup of coffee—and the thrill of saving a life. END

Build A MODERN READY-CUT HOME! Costs You Less!

Shipped Direct from Our Mill



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Save 30% to 40% on Your New Home..

Don't pay several hundred dollars more than necessary when you build a home! Buy direct from our mill at our low factory price. We ship you the lumber cut-to-fit, ready to erect. Paint, glass, hardware, nails, etc., all included in the price—no extra charges. Plans furnished—also complete building instructions. No wonder our customers write us that we saved them 30% to 40%. Architecturally approved construction. (Not built in sections.)

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Many thousands of Liberty Homes have been built in all parts of the country. There is one near you that you can visit and inspect. Write us and we will give you its location.

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Never before has the demand for welding been so great—the profits so large. That's why smart operators everywhere are setting up their own welding business . . . and you can do the same.

SIMPLY CHOOSE from our complete line, the welder that best suits your needs—gas or electric drive—portable or stationary. The big pay jobs are waiting, so don't miss this opportunity. Write today.

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"One of the world's largest builders of arc welders"

Big, Money-Saving Offer Repeated by Popular Demand

MEYERCORD'S AMAZING, LIFELIKE

PLASTIC VENEER

Re-creations of rare wood grains and fine marble

it's easy to DECORATE

- furniture
- cabinets
- lamp bases
- book ends
- walls, doors
- table tops
- re-finish old pieces

SAVE NOW! SEND FOR INTRODUCTORY PACKAGE!

Now—Meyercord, originators of Plastic Veneer, again offers you re-creations of rare wood grains and fine marbles at a *big saving!* Used on furniture and TV cabinets for years, yet easy to apply at home—on wood, metal, glass or composition. Praised by thousands of home craftsmen for amazingly beautiful results! Plastic Veneer can be used on any flat or simple curved surface—can be top-coated, rubbed or waxed. Start your first project today! Order a supply now!

INTRODUCTORY OFFER!
3 sheets of plastic veneer
1 can of cement
1 squeegee
ALL FOR ONE PRICE **$5.00** POST PAID

CHECK COUPON—MAIL TODAY!

THE MEYERCORD CO., Dept. 63-9 5323 W. Lake St., Chicago 44, Ill.
Please send me your $5.00 introductory offer of 3 sheets of Meyercord Plastic Veneer, squeegee, cement and complete instructions. Patterns are checked below.

Enclosed find ☐ check, ☐ M.O. for $5.00. Plus $_____ for _____ additional sheets, @ $1.50 for wood grains, $1.60 for marble, pearl and gingham. Each sheet contains 6 sq. ft.

☐ Prima Vera
☐ Aspen Crotch
☐ Straw Carpathian
☐ Satinwood
☐ Straw Zebrawood
☐ Limed Oak Tan
☐ Straw Stump
☐ Blond Harewood
☐ Bleached Mahogany
☐ Bleached Fiddleback
☐ Gray Harewood
☐ Prima Vera Gray
☐ Limed Oak Gray
☐ Striped Mahogany
☐ Fiddleback Mahogany
☐ Mahogany Crotch
☐ Mahogany Stump
☐ Walnut Crotch
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☐ Quartered Walnut
☐ Ribbon Walnut
☐ Striped Walnut
☐ Carpathian Burl
☐ French Rosewood
☐ Butt Walnut
☐ Walnut Stump
☐ Italian Walnut
☐ Rhododendron Burl
☐ Macassar Ebony
☐ Quinceawood
☐ Fiddleback Walnut
☐ Walnut Angle Grain (45°)
☐ Mottled Pearl—Gray
☐ Mottled Pearl—Maroon
☐ Mottled Pearl—Blue
☐ Red-White Gingham
☐ Blue-White Gingham
☐ Black and Gold Marble
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☐ Jaune Benou Marble
☐ Mexican Onyx
☐ Rose de Brignole Marble
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☐ Verdi Antique Marble

NAME_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____
(Offer good in continental U.S.A. only)

How to Take Dog Photos

[*Continued from page 208*]

at f/4.5 or better. Roll-film cameras are fine because you can afford to make a lot of shots on the chance of getting two or three really good pictures out of each roll.

Simple Setup Gives Good Light

Fast exposures, necessary to record the fleeting expressions that make good dog pictures, require lots of illumination. Outdoors, Old Sol provides all you need. Indoors, you can use a flashgun or two or three photofloods.

If you use a single flash unit, hold it high over and slightly forward of the camera, so the dog's shadow will fall low and behind him. If you have two lights, place them evenly on both sides of the shooting area, well above the subject's position and just outside of camera range. If a third boom-mounted light is available, shine it down on the dog's head from an overhead position. Hanks standardizes on this setup with three strobes.

It is helpful to fire flashguns by means of remote-control extension cords. If you use floodlights, get the longest cable release you can find. These long controls will enable you to maneuver around and trip the shutter quickly when the dog is in a favorable pose.

Dog Actors Can Be Temperamental

Use the fastest shutter speed permitted by the available illumination: not less than 1/100 second, and preferably 1/200 or 1/400. The technique is to shoot and shoot and shoot as you coax your pup into playing actor. Since he can't really hold a pose, you won't know whether you have masterpieces or mistakes until you process each batch of film.

A dog may become nervous the first time he is subjected to blazing or blinking lights. Don't force him to pose; cut the session short and try again the next day. He'll soon get the idea that you only want him to stay put for short periods and make faces. It's good policy to do the picture-taking just before the dog's mealtime. He may then feel the food is a reward for his cooperation. END

Photographing your boss, or any other V.I.P., takes more than just skill with a camera. Next month Ralph Steiner, celebrity portraitist, tells you how to do it.

You'll find hundreds of time and money-saving uses for this

NEW 2 SPEED 100° ANGLE

BUFFING AND SANDING ATTACHMENT

A complete kit with 2-speed, 100° angle drive unit, 5" rubber pad, 2 5" sanding discs and 5" lamb's wool bonnet. $8.45*

*Price slightly higher in West and Canada

MILLERS FALLS TOOLS SINCE 1868

The Mark of Superiority

FITS ANY ¼-INCH ELECTRIC DRILL and makes it an efficient rotary polisher and sander. Operates at ½ or twice drill speed. Exclusive 100° angle feature keeps drill and cord clear of work. A sturdy, smooth-running tool that makes countless jobs quick and easy. Grease sealed lubrication. Machine-cut steel gears. Ask for it at your hardware dealer's.

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- "Better Painting"
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Here are 101 useful ways to use America's finest 100% pure linseed oil. Perfect for painting and the handiest item for every housewife, homeowner and farmer. Available at all stores.

EARN $2.00 EASY

We will pay $2.00 for each new practical idea for using Pol-mer-ik Linseed Oil, which is acceptable to our research laboratory. Write Archer Daniels Midland, 604 Roanoke Bldg., Minneapolis, Minnesota.

Guaranteed by Good Housekeeping

ARCHER Pol-mer-ik 100% PURE LINSEED OIL

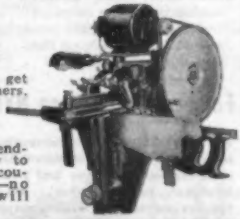
Make $20 to $30 a Week EXTRA MONEY!

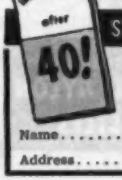
With the high prices of food, clothing and everything else, just think what you could do with extra money every week! Turn your spare time into CASH—sharpening saws with a Foley Automatic Saw Filer pays up to $2 or $3 an hour. Start in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws"—says M. L. Thompson. With a Foley you can file all hand saws, also band and cross-cut circular saws.

FREE BOOK

Shows How to Start

It explains how you can get business from home owners, farmers, carpenters, schools, factories, etc. "I get work from 20 and 30 miles away"—says Charles H. Smith. Free Book, "Independence After 40," tells how to start. Send coupon today—no salesman will call.





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Send FREE BOOK—"Independence After 40."

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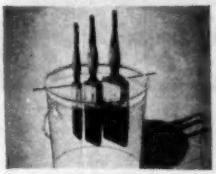
POINTERS FOR HOME PAINTERS

How to increase your painting skill . . . make your brushes last longer

When painting flat surfaces, use long, steady strokes. Don't bear down on your brush. Heavy strokes don't distribute paint properly.

Brush oil-based paints out in thin, even coats. This makes the finish more durable, and thin coats of paint dry much faster.



Clean brushes with thinner after daily use. Suspend brushes in thinner overnight. Bristle tips should not touch bottom of can. Work out thinner before painting again.

For storage, clean brush with thinner, then scrub bristles on a board with warm water and cleanser, rinse in clear water, comb bristles, wrap in paper to store.

For best results use NYLON PAINT BRUSHES

Job after job, you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles don't break off, even on roughest surfaces. They last 3 to 5 times longer than ordinary bristles . . . paint smoother . . . are clean and sanitary. Nylon paint brushes are made by leading manufacturers in all types and sizes. Look for the word NYLON on the handle.

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Better Things for Better Living
. . . through Chemistry

The best brushes have
DU PONT NYLON
BRISTLES

Bracket Holds Antenna Lead

MOVING an indoor TV antenna around to get the best position often twists the leads to the set. Twisted leads may short out or pull loose from the terminals. One remedy is to fasten the flat ribbon lead-in to the cabinet near the input connections as shown. Any strip of wood, metal, or plastic will keep the leads in order no matter how much you may move the antenna.

Nails Raise Furniture for Painting

BEFORE painting the legs of a small table, chair, or other light piece of furniture, drive a nail part way into the bottom of each leg. This will keep the legs free of the workbench and help make the job easier and neater.

Old Light Bulbs Cause TV Troubles

SOME mysterious interference on your TV screen may be caused by an ancient straight-wire filament bulb somewhere in the house. Such lamps, manufactured up to about 1925, have been found by GE researchers to produce enough radiation to interfere with even strong television signals.

Rain Makes the Oceans Salty

RAIN falling on the earth's soil dissolves minute quantities of salt and other compounds that are carried to the oceans by streams and rivers. The sun's heat evaporates the water, which again falls as rain. The repetition of this cycle through the ages has continually increased the salt in the oceans.

NOTHING LIKE IT AT THE PRICE
for POWERFUL, FAST CUTTING PRODUCTION

Model 2000—with **straight-line reciprocating action** that **guarantees scratch-free surfaces**—is a fast-cutting production sander for heavy-duty craft and woodworking projects—for hobby work, refinishing and redecorating. It gives you the added stroke and power required for furniture and cabinet making, boat building or refinishing, resurfacing large areas, sanding plastics, leather, etc. Great for building operations such as woodwork, dry wall joints, siding and other exteriors. Also does a superb wax-polishing job! Buy it, try it, compare Model 2000 with any competitive electric sander. You be the judge!

ONLY $24.50 WITH STEEL CARRYING CASE AND COMPLETE ACCESSORIES

14,400 Sanding Strokes Per Minute

21 SQUARE INCHES OF SANDING SURFACE!

OUTSTANDING Model 2000 FEATURES

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LIGHTER CAPACITY MODEL "A" FOR HOUSEHOLD SANDING-POLISHING JOBS

Housewives, homeowners, hobbyists go for Model "A". Over a quarter-million now in use! Perfect for all household sanding, polishing, refinishing. Also a soothing massager. Only 2½ lbs.; sanding pad 2¼"x5½". Same construction features as larger Model. With 6 sheets sandpaper, sheepskin, felt pad.....Only $14.85

WHERE TO BUY DREMEL SANDERS

If your dealer can't supply, send full remittance for postpaid shipment, Or send only $2, and pay postman balance plus postage and C.O.D. fee. **Money back if not delighted after 5 days' trial.**

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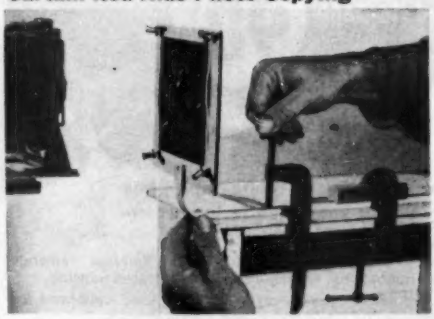

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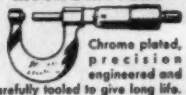

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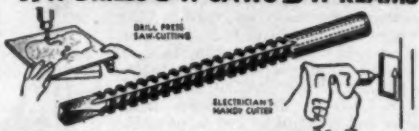

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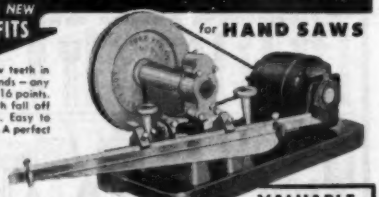

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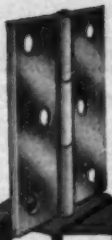

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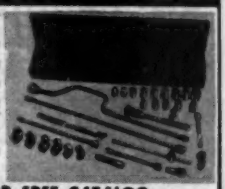

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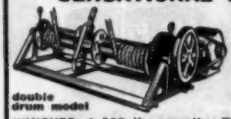

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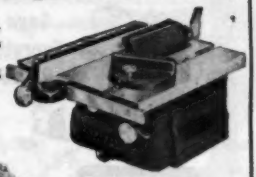

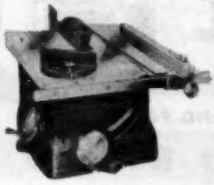

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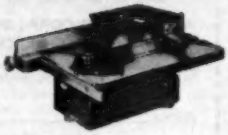

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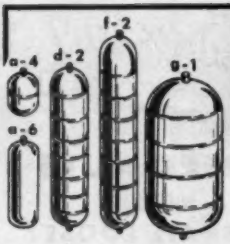

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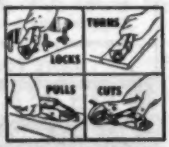

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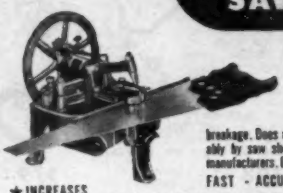

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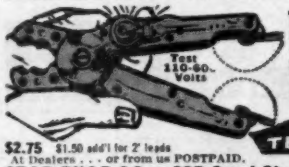

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Gus and the 10-Mile Car

[Continued from page 184]

Right at that moment the engine gave out with a gasping noise, caught on again and died. Gus glanced down at the speedometer—they'd driven just 10.2 miles.

"What do you think, Mr. Wilson?"

Gus was smiling confidently. "From all the symptoms, I'd say you had a vapor lock. You see, when the fuel gets too hot, like when the engine heats up on a warm day, it begins to vaporize—change from a liquid to a gas. The fuel can't reach the carburetor properly, and the engine dies."

"I see," said Ed doubtfully.

Gus Makes a Mistake

Gus quickly lifted the hood and began running his hand along the line leading to the carburetor. Then he straightened up. "That's funny. The line isn't hot at all—not nearly hot enough to cause a lock."

Ed Norton sighed. "Well, I'm much obliged to you, Mr. Wilson, for tryin'. I've got some friends down the road a piece that'll be glad to get out their pick-up truck and push us home."

Gus winced. He had been overconfident, like a greenhorn grease monkey, and now the old man probably wouldn't believe he could fix a kiddie car. "Hold on a minute, Ed. Let's give it another try."

The light was failing, and Gus had to work fast now. Although he suspected that it might be dirt in the gas tank clogging the fuel line or a carburetor jet, he decided to look for the simple things first in the hope that a lucky hit might save time. So, with Ed watching, he checked the distributor, the coil, and the connections to the generator, battery and ignition switch.

Hunch Pays Off

Drawing a complete blank at each, Gus was about to start checking the carburetor when he remembered what Ed had said about the new gas-tank cap. Quickly he walked to the rear of the car and began twisting the cap to loosen it. Suddenly he stopped, stooped down, and started moving his hand around underneath. Then he began wriggling his way in under the car.

"I think maybe I've found your trouble Eddie," came back Gus's muffled voice. "If you've got friends nearby, how about seein' if they'll lend you a 10-inch square of sheet tin and some baling wire. And borrow a pair of pliers, too, while you are about it."

Before long, Ed was back with the tin, wire and pliers and handed them to Gus.

"There, I think that'll do it," Gus said when he finally emerged from under the car. "Let's try her now."

The trip home was uneventful, and Gus even insisted on driving an extra five miles.

"What was it?" asked Ed.

Knew It All the Time

"Just like I thought," said Gus, trying to sound as if he had known it all the time. "Vapor lock. You had a hole rusted through the top of your exhaust tailpipe, and it was spraying hot gases over the bottom of the tank and the fuel line. The heat vaporized the gasoline in the fuel line and caused a vapor lock. When you'd let her set awhile, the lock would disappear."

"How'd you ever think of that?"

"I got my hunch when I decided to check that gas-tank cap you said the boys in town put on. When I touched it, it was warm. Then I felt the bottom of the gas tank and it was even warmer. That gave me the tip-off to look for a rusted-through tailpipe."

"And you fixed it by wiring on a tin sleeve to cover the hole?"

"Right, Eddie, but that's just a temporary repair. I'd suggest you take your car into town Monday and put in a new tailpipe."

Gus Passes Up the Pie

When they pulled up in front of the motel office, Clara was sitting patiently on the front porch. Ed hopped out of the car as if he were jet-propelled. "Clara, the car's fixed. Mr. Wilson found the trouble."

Clara Norton was overjoyed. "Mr. Wilson, I don't know how to thank you."

"Well, we might at least invite him in for a wedge of pie and a glass of milk," suggested Ed.

Gus wasn't one to turn down food very often, but an idea had suddenly come to him. "Thanks a lot," he said appreciatively, "but if you folks don't mind I think I'll turn in right now so I can be up early. I want to try out this little lake of yours before I start headin' for home. From the looks of those lily pads out there, I've a hunch I can reel in a few pickerel. I'd like to catch something before I have to get back to tending ailing cars again." END

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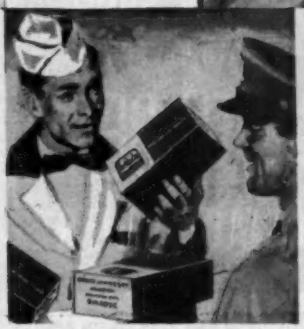

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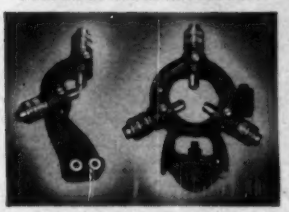

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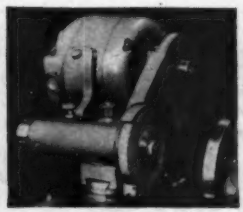

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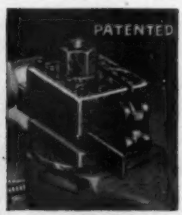

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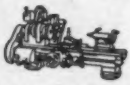

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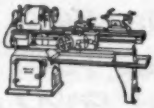

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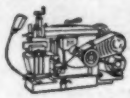

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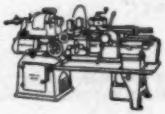

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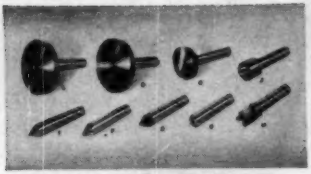

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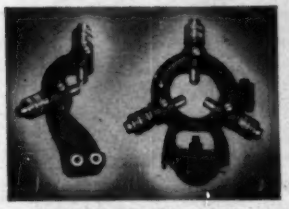

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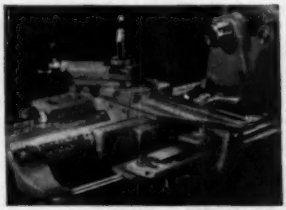

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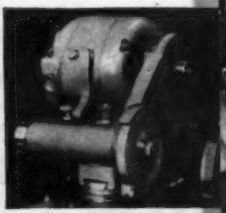
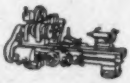


EXTERNAL GRINDER

Send this Information:

CATALOG 5111



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Name_____

Street_____

City_____ Zone_____ S

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doing Radio Service full time. Have my shop and am making money now than I did before. Owe this R.I."—Curtis Staeth, Madison, Iowa.

N.R.I. Graduate Doubles Salary

"I am employed by Station WKBO, as transmitter operator. Have more than doubled my salary since starting in Radio full time."—A. A. Herr, New Cumberland, Pa.

$10 to $15 Week Spare Time

"4 months after enrolling for N.R.I. course, averaged $10 to $15 a week in spare time servicing Radios." — W. Weyde, Brooklyn, N.Y.

Shop Specializes In Television

"Have my own shop. Am authorized serviceman for 5 large manufacturers and do servicing for 7 dealers." — Paul Miller, Maumee, Ohio.

Calls N.R.I. His "Stepping Stone"

"N.R.I. has been my stepping stone from a few hundred to over $4,000 a year as a Radio Engineer. Make extra money servicing Radios."—Alton B. Michaels, Trenton, Ga.

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Buddy Rogers likes to try things out. He plays every instrument in the band. His curiosity also led him to try different cigarette mildness tests. The thorough 30-day Camel test convinced him.

"After smoking Camels for thirty days, I knew it was Camels for me," says Buddy. "Only Camels give me such flavor, mildness and enjoyment!"

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Smoke only Camels for 30 days. See how rich and flavorful Camels are, pack after pack. Then you'll know why—

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